WHITE PINE BLISTER RUST CONTROL

IN THE

NORTHWESTERN REGION

January 1 to December 31, 1946

United States Department of Agriculture
Bureau of Entomology and Plant Quarantine
Division of Plant Disease Control
Blister Rust Control
618 Realty Building
Spokane, Washington

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Herman E. Swanson, Regional Leader

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The 1946 blister rust control program in the Northwestern Region was organized along the same lines as in previous years. Agencies actively cooperating in the ribes eradication program are: Bureau of Entomology and Plant Quarantine, United States Forest Service, National Park Service, State of Idaho, and the Clearwater, Potlatch and Priest Lake Timber Protective Associations of North Idaho.

Progress. During 1946, a total of 56,372 acres were worked including 10,605 acres first working, 24,596 acres second and 21,171 acres third. While this represents a 10 per cent increase over 1945 accomplishments, several factors prevented greater progress and contributed to high operating costs. A shortage of qualified labor continued to be a handicap. Again, the loss of time by blister rust crews from project work to fight forest fires was particularly disrupting to the Forest Service program and caused a serious increase in blister rust control costs. To these handicaps was added the 40-hour work week for the first time since the WPA program. This short work week imposed upon a seasonal project which employs and trains a new field force each year and constructs temporary camps each season increased operating costs and slowed down progress. An analysis of the Bureau's program indicated that a 48-hour week in 1946 with time and a half pay for hours in excess of 40 per week would have made a saving of 26 per cent.

Labor. As during the war years, boys 16 years of age and older were the principal source of labor, although more adults and veterans accepted jobs than in previous years. Boys in the 16-year-old group were hired only to build up the camp quotas to full strength. The Forest Service used Mexican Nationals to a considerable extent. German internees and Civilian Public Service workers, an efficient type of labor on some units during the war, were not available in 1946. At the peak of the season, 2,518 workers in 55 camps were engaged on blister rust control in the Northwestern Region.

Infection Conditions. Blister rust infection was found on ribes near Teton Pass, west of Jackson, Wyoming. This discovery extended the known limits of the rust in this territory by 110 miles from Mammoth Hot Springs in the northwestern part of Yellowstone National Park.

Spread and intensification of the rust were very light in 1942, 1943 and 1944. Weather conditions in the late summer and fall of 1945 and 1946 were such to permit a build-up of the rust, but in neither year is this build-up expected to be as severe as in a wave year like 1941. In 1945, heavy ribes infection in the fall was not generally distributed, and any serious spread from ribes to pine was probably limited to certain parts of the region. In the fall of 1946 there was considerably more ribes infection throughout the region which may have spread to pine during the periods of suitable climatic conditions.

Methods. Ammonium sulfamate and 2,4-D in their respective fields replaced Atlacide in the treatment of ribes in stream type. Ammonium sulfamate is effective on both Ribes petiolare and R. lacustre which often occur together. Its use in such situations cuts labor costs about 30 per cent since the job is done in one operation, whereas only R. petiolare was killed with Atlacide, and R. lacustre had to be pulled by hand. Where R. petiolare occurs alone, 2,4-D is used, costing only 2 cents per gallon as against about 14 cents for other chemicals. Where chemical must be back-packed into remote areas, substantial labor savings are made since the amount of 2,4-D required is only 1/160 the weight of other chemicals necessary to do the same job. With the new developments in chemicals, power spraying equipment has been tested for extending this method of ribes eradication to upland areas. Four power units have been secured and are being mounted lower on the trucks to increase maneuverability in mountain areas.

The Division of Timber Management of the Forest Service in Region One extended the application of methods in timber cutting and stand improvement which are designed to reduce the ribes factor represented in living plants and stored seed. Timber marking rules in the white pine type for Region One are now being revised to incorporate these methods as standard practice. A conference of Forest Service timber sales men was held at the Deception Creek Experimental Forest to observe first hand the developments in timber management as related to blister rust control.

Summary of Progress

A summary of blister rust control activities in the Northwestern Region is presented in the following tables:

TABLE 1

SUMMARY OF RIBES ERADICATION BY STATES AND OPERATING AGENCIES - 1946

State	Operating Agency	First Working			Second Working			Other Workings			All Workings			Per Acre		Number of Camps	Total Seasonal Employees
		Acres	Ribes Destroyed	Man-Days	Acres	Ribes Destroyed	Man-Days	Acres	Ribes Destroyed	Man-Days	Acres	Ribes Destroyed	Man-Days	Ribes	Man-Days		
Idaho	BEPQ	3,762	877,392	4,482	14,604	366,389	10,436	11,662	417,980	9,884	30,028	1,661,761	24,802	55	.83	20	927
	FS	2,441	772,107	3,804	6,266	284,892	6,785	8,331	400,443	13,635	17,038	1,457,442	24,224	86	1.42	22	1,000
	Subtotal	6,203	1,649,499	8,286	20,870	651,281	17,221	19,993	818,423	23,519	47,066	3,119,203	49,026	66	1.04	42	1,927
Montana	FS	2,386	265,130	6,637	182	23,158	369	391	19,914	518	2,959	308,202	7,524	104	2.54	7	321
	NPS	88	42,967	651							88	42,967	651	488	7.40	1	30
	Subtotal	2,474	308,097	7,288	182	23,158	369	391	19,914	518	3,047	351,169	8,175	115	2.68	8	351
Washington	FS	1,481	889,143	3,840	3,392	127,636	1,896	787	27,426	785	5,660	1,044,205	6,521	184	1.15	4	213
Wyoming	NPS	447	87,806	701	152	6,394	67				599	94,200	768	157	1.28	1	27
All States	BEPQ	3,762	877,392	4,482	14,604	366,389	10,436	11,662	417,980	9,884	30,028	1,661,761	24,802	55	.83	20	927
	FS	6,308	1,926,380	14,281	9,840	435,686	9,050	9,509	447,783	14,938	25,657	2,809,849	38,269	110	1.49	33	1,534
	NPS	535	130,773	1,352	152	6,394	67				687	137,167	1,419	200	2.07	2	57
Total		10,505	2,934,545	20,115	24,596	808,469	19,553	21,171	865,763	24,822	56,372	4,608,777	64,490	82	1.14	55	2,518

TABLE 2

ACREAGE WORKED BY LAND OWNERSHIP - 1946

Land Ownership	First Working Acres	Second Working Acres	Other Workings Acres	All Workings Acres
National Forest Region 1	5,867	11,637	11,079	28,633
National Park	535	152		687
Public Domain		10	324	334
State and Private	4,203	12,747	9,768	26,718
Total	10,605	24,596	21,171	56,372

TABLE 3

SUMMARY OF EXPENDITURES - FEDERAL AND COOPERATIVE - 1946

State	Cooperative Funds		Total Federal Funds	Total All Funds	Federal Funds				Cooperative Funds Direct Aid			Expenditures Ribes Eradication
	Total (Direct and Indirect Aid)	Direct Aid			Entomology and Plant Quarantine 3101	Entomology and Plant Quarantine 3103	Forest Service	Park Service	State	Private	Total	
Idaho	$42,595.00	$41,595.00	$1,060,344.40	$1,102,939.40	$101,834.22	$118,189.00 (I)297,690.93	$542,630.25		$14,943.35	$26,651.65	$41,595.00	$1,000,105.18
Mont.	1,000.00		198,963.45	199,963.45	13,758.79		172,730.78	$12,473.88				185,204.66
Wash.	1,000.00		166,046.84	167,046.84	12,060.13		152,844.00	1,142.71				152,844.00
Colo.	200.00		500.00	700.00	500.00							
Wyoming	200.00		14,690.14	14,890.14	3,858.81			10,831.33				10,831.33
Total	$44,995.00	$41,595.00	$1,440,544.83	$1,485,539.83	$132,011.95	$415,879.93	$868,205.03	$24,447.92	$14,943.35	$26,651.65	$41,595.00	$1,348,985.17

(I) Intermingled lands

TABLE A

STATUS OF RIBES ERADICATION BY STATES - ALL OWNERSHIPS, DECEMBER 31, 1946
Accumulative Series - Net

State	Total Acres		First Working		Second Working	Other Workings	On Maintenance		Remaining Work	
	White Pine	Control Area (Wh.P.& Prot.Zone)	Acres	Per Cent	Acres	Acres	Acres	Per Cent	Unworked Acres	Requiring Rework Acres
Idaho	2,254,664	2,254,664	1,508,088	67	384,117	98,481	477,537	21	746,576	1,030,551
Montana	212,781	212,781	138,371	65	14,405	5,543	62,824	30	74,410	75,547
Washington	152,964	152,964	113,205	74	42,026	18,220	35,444	23	39,759	77,761
Subtotal	2,620,409	2,620,409	1,759,664	67	440,548	122,244	575,805	22	860,745	1,183,859
Wyoming	230,778	230,778	23,774	10	152		10,225	4	207,004	13,549
Colorado	206,000	206,000	14,859	7	1,962		8,000	4	191,141	6,859
Subtotal	436,778	436,778	38,633	9	2,114		18,225	4	398,145	20,408
Total	3,057,187	3,057,187	1,798,297	59	442,662	122,244	594,030	19	1,258,890	1,204,267

TABLE B

SUMMARY OF STATUS OF RIBES ERADICATION BY LAND OWNERSHIP, DECEMBER 31, 1946
Accumulative Series - Net

Land Ownership	Total Acres		First Working		Second Working	Other Workings	On Maintenance		Remaining Work	
	White Pine	Control Area (Wh.P.& Prot.Zone)	Acres	Per Cent	Acres	Acres	Acres	Per Cent	Unworked Acres	Requiring Rework Acres
National Forests R-1	1,403,219	1,403,219	1,050,657	75	255,573	59,889	342,498	24	352,562	708,159
National Forests R-2 & 4	*421,000	*421,000	36,619	9	1,962		17,000	4	384,381	19,619
Subtotal	1,824,219	1,824,219	1,087,276	60	257,535	59,889	359,498	20	736,943	727,778
National Parks	24,087	24,087	9,236	38	5,894	7,158	6,875	29	14,851	2,361
Public Domain	29,409	29,409	16,717	57	5,990	1,690	5,509	19	12,692	11,208
Subtotal--Interior	53,496	53,496	25,953	49	11,884	8,848	12,384	23	27,543	13,569
Total--Federal	1,877,715	1,877,715	1,113,229	59	269,419	68,737	371,882	20	764,486	741,347
State & Private Lands	1,179,472	1,179,472	685,068	58	173,243	53,507	222,148	19	494,404	462,920
Total	3,057,187	3,057,187	1,798,297	59	442,662	122,244	594,030	19	1,258,890	1,204,267

*Indefinite

Cooperative Blister Rust Control on State and Private Lands in 1946

Blister rust control on state and private lands in 1946 was conducted by the Bureau of Entomology and Plant Quarantine in cooperation with the State of Idaho and the Clearwater, Potlatch and Priest Lake Timber Protective Associations. Part of the federal appropriations was earmarked for use where federal lands are intermingled with other lands. In view of the intermingled ownership existing in much of the forest land in north Idaho, the camps operating under these special funds could be located on high priority white pine sites within or near the Association boundaries.

The field project included 20 camps with a total of 927 workers. The camps and workers were distributed as follows: Clearwater, 7 camps, 295 workers; St. Joe (Potlatch), 7 camps, 357 workers; Kaniksu (Priest Lake), 6 camps, 275 workers. This substantial increase over the 1945 program of 429 workers was made possible by a large increase in federal appropriations.

In 1946, 30,038 acres were worked, much of which will go on maintenance as a result of the last working. On the other hand, control work was started on some high priority white pine lands which have recently been cut over which will require an average of three workings before protection is established.

Details on the cooperative work will be found in the Clearwater, St. Joe, and Kaniksu operational reports.

Results of the 1946 program and net progress on state and private lands are summarized in the following tabulations:

1. Allotments

	Fiscal Year 1946	Fiscal Year 1947
Federal		
State and Private Lands	$224,400.00	$361,011.00
Intermingled Lands		320,000.00
State of Idaho	15,000.00	15,000.00
Clearwater T.P.A.	6,416.58	6,422.40
Potlatch T.P.A.	5,262.40	5,420.30
Priest Lake T.P.A.	4,260.44	4,066.54
Total	$255,339.42	$711,920.24

2. Expenditures - Calendar Year 1946

Operation	State and Private	Federal (BLR-3-4)	Total
Clearwater	$13,738.85	$131,747.08	$145,485.93
St. Joe (Potlatch)	13,626.30	147,202.88	160,829.18
Kaniksu (Priest Lake)	14,229.85	136,929.97	151,159.82
Total	$41,595.00*	$415,879.93	$457,474.93

*State, $14,943.35; Private, $26,651.65. Cash expenditures, 1928-1946: State, $208,442.67; Private, $167,343.15; Total, $375,785.82.

3. Cooperative Ribes Eradication in Idaho, 1946

Operation	Acres Worked Initial	Rework	Total	Man-Days	Ribes	Per Acre Man-Days	Ribes
Clearwater	1,813	3,786	5,599	7,614	1,036,693	1.36	185
St. Joe	59	8,091	8,150	8,947	251,691	1.10	31
Kaniksu	1,890	14,389	16,279	8,241	373,377	.51	23
Total	3,762	26,266	30,028	24,802	1,661,761	.83	55

4. State and Private Lands Worked in 1946

State	Acres Worked First	Second	Third	Total
Idaho	3,997	12,517	9,719	26,233
Montana	37	95	49	181
Washington	169	135	-	304
Total	4,203	12,747	9,768	26,718

5. Progress on State and Private Lands, 1923-1946 (Net Acres)

State	Acres Worked First	Second	Third	Acres Unworked	Total Acres in Control Area
Idaho	642,077	159,434	46,986	474,218	1,116,295
Montana	19,729	2,375	1,840	15,028	34,757
Washington	23,262	11,434	4,681	5,158	28,420
Total	685,068	173,243	53,507	494,404	1,179,472

Blister Rust Control on National Forests
Region One - 1946

Blister rust control work in 1946 was conducted by the Forest Service on six national forests along much the same lines as in 1945.

Shortage of labor prevented the Forest Service from building up to desired strength. At the peak of the season the project numbered 33 camps and 1,591 workers as against 35 camps and 1,843 workers in 1945. Boys 17 years and older were the principal source of labor although Mexican Nationals were again employed to augment the field force. War internees, who had been an important and efficient part of the field force during the war, were no longer available. The number of camps and workers on each forest were as follows:

National Forest	Camps	Workers
Clearwater	5	185
St. Joe	8	429
Coeur d'Alene	7	335
Kaniksu	6	264
Cabinet	3	153
Kootenai	4	168
Total	33	1,534

The 40-hour work week and the loss of time to fire combined to greatly impede progress and increase costs. These factors need correction as they are rendering blister rust control costs prohibitive on many areas as well as making it difficult to secure the efficiency necessary to control the rust.

The Division of Timber Management extended the application of practices, designed to eliminate or minimize the ribes factor represented in living plants or stored seed, on timber sale and stand improvement areas in the white pine type. The ecology of white pine and ribes was reviewed by the timber management men from the white pine forests at an October conference held at Deception Creek Experimental Forest. Marking rules for the white pine type are also being revised to incorporate these new practices.

The Forest Service initiated a study of the blister rust control situation in Region One. This study will involve a comprehensive analysis of the technical and economical aspects of the problem for the purpose of developing a Forest Service policy for the management of white pine in Region One. The study is being conducted by Mr. D. N. Matthews, Silviculturist, and Mr. S. Blair Hutchison, Forest Economist.

The following tabulations summarize the expenditures and progress of work on national forest lands:

1. Expenditures, 1946

Clearwater	$109,209.74
St. Joe	223,578.59
Coeur d'Alene	174,417.11
Kaniksu	188,268.81
Cabinet	91,826.00
Kootenai	80,904.78
Total	$868,205.03

2. Expenditures, 1930-1946

Forest	Regular	Emergency	Total
Clearwater	$1,045,462.67	$ 413,454.80	$1,458,917.47
St. Joe	2,066,573.65	383,340.06	2,449,913.71
Coeur d'Alene	1,135,117.45	669,809.81	1,804,927.26
Kaniksu	1,089,394.86	458,055.36	1,547,450.22
Cabinet	446,549.26	258,476.52	705,025.78
Kootenai	211,133.42	28,233.00	239,366.42
Total	$5,994,231.31	$2,211,369.55	$8,205,600.86

3. Ribes Eradication by Forest Service Crews, 1946

Forest	Acres Worked			Man-Days	Ribes	Per Acre	
	Initial	Rework	Total			Man-Days	Ribes
Clearwater	1,319	3,657	4,976	4,588	236,343	.92	47
St. Joe	262	5,087	5,349	10,586	535,942	1.98	100
Coeur d'Alene	499	4,153	4,652	7,557	426,018	1.62	92
Kaniksu	1,842	5,879	7,721	8,014	1,303,344	1.04	169
Cabinet	601	438	1,039	4,432	194,900	4.27	188
Kootenai	1,785	135	1,920	3,092	113,302	1.61	59
Total	6,308	19,349	25,657	38,269	2,809,849	1.49	110

4. Ribes Eradication on National Forest Lands, 1923-1946

Forest	Net Acres Worked			Acres Unworked	Total Acres
	First	Second	Third		
Clearwater	151,457	51,540	8,768	48,895	200,352
St. Joe	215,199	79,101	24,470	97,009	312,208
Coeur d'Alene*	307,070	49,431	12,972	53,976	361,046
Kaniksu	261,970	65,673	10,623	94,387	356,357
Cabinet	62,976	7,801	2,901	11,050	74,026
Kootenai	51,985	2,027	155	47,245	99,230
Total	1,050,657	255,573	59,889	352,562	1,403,219

*Includes 310 acres first working and 80 acres unworked on Mount Spokane operation.

Blister Rust Control on National Parks in 1946

Ribes eradication in 1946 was conducted by the National Park Service on Glacier and Yellowstone National Parks. The work on Mount Rainier was limited to checking the control areas to determine the needs for future work. Separate reports have been prepared for the work on each Park.

An inspection was made of conditions in Rocky Mountain National Park to determine the feasibility of undertaking control work on selected areas. The results of this inspection are presented in a Memorandum to the Regional Director, Region Two, dated November 1, 1946, prepared by Frank W. Childs, Regional Forester. Briefly, it appears that of the areas examined the Longs Peak-Estes Cone area would warrant the cost of blister rust control and that a survey should be conducted to determine the extent of the area to be worked and the estimated man-days required to establish protection.

Scouting revealed blister rust infection on ribes near Teton Pass, west of Jackson, Wyoming. This extended the known limits of blister rust in this region by 110 miles. Previously it had been found at Mammoth Hot Springs, Yellowstone National Park. A summary of the scouting work in Yellowstone and Grand Teton National Parks prepared by C. M. Chapman, Pathologist, follows this report.

The following tabulations summarize the expenditures and progress of work on National Parks in the Northwestern Region:

1. Expenditures by National Park Service

National Park	Calendar Year 1946	All Years
Mount Rainier	$ 1,142.71	$ 80,674.26
Glacier	12,473.88	23,623.44
Yellowstone	10,831.33	16,550.26
Total	$24,447.92	$120,847.96

2. Ribes Eradication on National Parks, 1946

	Acres Worked					Per Acre	
National Park	First	Second	Total	Man-Days	Ribes	Man-Days	Ribes
Glacier	88		88	651	42,967	7.40	488
Yellowstone	447	152	599	768	94,200	1.28	157
Total	535	152	687	1,419	137,167	2.07	200

3. Gross Acreage Worked on National Parks, 1930-1946

	Acres Worked						Per Acre	
National Park	First	Second	Third and Other	Total	Man-Days	Ribes	Man-Days	Ribes
Mount Rainier	8,254	4,327	6,731	19,312	22,051	2,242,619	1.14	116
Glacier	3,641	2,202	647	6,490	6,833	740,725	1.05	114
Yellowstone	2,014	152		2,166	1,760	189,969	.81	88
Total	13,909	6,681	7,378	27,968	30,644	3,173,313	1.10	113

4. Work Status in Net Control Area

National Park	Acres Worked: First	Second	Third and Other	Acres on Maintenance	Acres Unworked	Total Acres Control Area
Mount Rainier	3,581	3,540	6,511	3,000	-	3,581
Glacier	3,641	2,202	647	2,650	1,087	4,728
Yellowstone	2,014	152	-	1,225	6,764	8,778*
Rocky Mountain	-	-	-	-	7,000	7,000*
Total	9,236	5,894	7,158	6,875	14,851	24,087

*Estimate

SCOUTING FOR BLISTER RUST IN YELLOWSTONE AND GRAND TETON NATIONAL PARKS, WYOMING

By
C. M. Chapman, Pathologist

Limited sampling of ribes and pine in Yellowstone and Grand Teton National Parks, Wyoming, and vicinity in 1946 was confined to the more favorable spots for blister rust development.

The sampling showed six infections on ribes in the vicinity of Mammoth Hot Springs, Yellowstone National Park, Wyoming, and one infection on ribes near Teton Pass, west of Jackson, Wyoming, in the Teton National Forest.

Blister rust was found for the first time in Yellowstone National Park near Mammoth Hot Springs in 1944 on two Ribes petiolare bushes and again on the same area in 1945 on five R. petiolare bushes and one R. setosum bush. In 1946, 16 R. petiolare bushes and two R. setosum bushes were infected on the same area but outside the blister rust control protection zone. The 18 infected bushes found in 1946 were located within two to six miles of Mammoth Hot Springs, as follows:

Eagle Creek, three R. petiolare, sec. 13, T. 9 S., R. 8 E. Gallatin National Forest, Park County, Montana.

Slide Lake Creek, seven R. petiolare, sec. 35, T. 9 S., R. 8 E. Yellowstone National Park, Park County, Montana.

Gardiner River, one R. petiolare, sec. 12, T. 10 S., R. 8 E. Yellowstone National Park, Wyoming.

Lava Creek, two R. petiolare and one R. setosum, sec. 19, T. 10 S., R. 9 E. Yellowstone National Park, Wyoming.

Glen Creek, two R. petiolare and one R. setosum, sec. 26, T. 10 S., R. 8 E. Yellowstone National Park, Wyoming.

Clematis Gulch, one R. petiolare, sec. 15, T. 10 S., R. 8 E. Yellowstone National Park, Wyoming.

The increase of rust on ribes in the Mammoth area from 1944 to 1946 would indicate that rust is present on white pine in the vicinity of Mammoth Hot Springs, Yellowstone National Park, Wyoming.

The infection on ribes near Teton Pass, west of Jackson, Wyoming, consists of three R. petiolare bushes in sec. 19, T. 41 N., R. 17 W. and is located east of Teton Pass on Trail Creek in the Teton National Forest, Teton County, Wyoming. The infection on the three bushes was light and may be a long-distance spread of the rust from infected pine in Idaho.

Inspections of ribes and pine for blister rust were made at the following locations:

Teton National Forest, Wyoming:
Mail Cabin, Trail, Buffalo, Pacific, Pilgrim and Dime Creeks, and on the Divide at Teton Pass.

Grand Teton National Park, Wyoming:
Taggert, Cascade, and Glacier Creeks and small side streams on west side of Jenny Lake.

Yellowstone National Park, Wyoming:
West Thumb, Craig Pass, Old Faithful, Norris, Madison River, Gibbon River, Grebe Lake, Glen Creek, Clematis Gulch, Slide Lake, Gardiner River, Reese, Lava and Elk Creeks, Lamar River, Tower Falls, and Mount Washburn.

Gallatin National Forest, Montana:
Eagle Creek and Yellowstone River.

Identifications of blister rust on ribes were made by the Bureau of Plant Industry, Division of Forest Pathology, San Francisco, California.

BLISTER RUST CONTROL, INLAND EMPIRE, 1946

By

Frank O. Walters

Assistant Regional Leader

Organization. The valuable white pine lands of eastern Washington, western Montana, and northern Idaho comprise the Inland Empire section of the Northwestern Region. This section is in turn broken down into five administrative units as follows:

1. Clearwater Operation
2. St. Joe Operation
3. Coeur d'Alene Operation
4. Kaniksu Operation
5. Montana Operation (Kootenai and Cabinet National Forests)

The Coeur d'Alene and Montana operations are largely of Federal ownership. The other operations, in addition to the Federal lands, have large areas of State, private, and intermingled Federal lands. Most of these lands are included in the following three Timber Protective Associations: (1) Clearwater, (2) Potlatch, and (3) Priest Lake.

A Forest Service staff man administers the work of the Forest Service on its lands. A Bureau representative is assigned to each operation to direct the checking, disease, and classification surveys, and to afford technical advice to the Forest Service on matters relating to blister rust control. On operations where other than Federal lands are involved, the Bureau administers the ribes eradication activities on these lands.

Labor. With the cessation of hostilities and the closing of war industries, it was anticipated that a supply of efficient labor would be available. Such was not the case, and it was again necessary to depend largely on teen-age boys for labor. On the Kaniksu, St. Joe, and Cabinet Forests, Mexican Nationals were used on heavy work areas. A greater number of older, experienced men were available for overhead than at any time since 1942. This was a material help in providing supervision for the young workers.

Factors Contributing to Increased Costs and Inefficiency. Principal factors which contribute to unsatisfactory progress and increased costs are: (1) short season, (2) 40-hour week, (3) interference from fire, and (4) inefficient labor. Because of the large number of high school students employed, the field season extended only from mid-June to mid-August. By the time the men were fully trained, only six weeks of effective work was possible. The cost of establishing and dismantling camps is just as great as though a 4-month season were worked. The five-day week not only materially reduces the number of work days, but causes dissatisfaction on the part of the men. With two unpaid days each week, when the men are idle around camp and board is charged, they become restless and resentful. This situation was an important contributing factor to the large labor turnover. The greatest demand for blister rust crews for fire

fighting usually occurs in August, when the crews are at peak efficiency. This year nearly two weeks of working time were lost because of fire. Highly efficient labor is a necessity to secure the required quality of work to place the many areas of light ribes on maintenance.

Accomplishments. With more and better supervisory personnel and a better understanding of how to handle the teen-age worker, it was possible to show an increase in accomplishments over the past few years, as indicated by the following figures:

Year	Acres	Man-Days
1946	55,685	63,071
1945	46,504	62,619
1944	36,624	48,760
1943	35,934	44,757

Current Year's Work. On the Clearwater operation the Forest Service crews worked in pole stands in Rhoads, French, Tamarack, and Deadwood drainages. The Bureau camps located on lands administered by the Clearwater Timber Protective Association worked on cutover lands on which white pine is reproducing abundantly.

The Forest Service camps on the St. Joe operation carried on work in plantation areas near Emida and advance reproduction and pole stands near Clarkia. The Bureau operated largely on the extensive double burn areas in the vicinity of Elk River and Bovill. These areas, once considered devastated, are rapidly becoming completely stocked from seed supplied by scattered reproduction and pole trees.

The Coeur d'Alene operation continued protection work on the extensive 1935 plantations in the vicinity of Jordan Creek. Work was also done on the pole and reproduction areas on the north fork of the Coeur d'Alene river.

On the Kaniksu operation the Forest Service worked on the large plantation area in the Kalispell basin and Lamb Creek. Protection was also given to most of the pole stand in the Upper West Branch. The Bureau operated in the extensive blocks of pole and advance reproduction in the Trapper Creek and Pack River Drainages.

In Montana the Kootenai Forest gave additional protection to the pole stands in the Yaak River drainage. The Cabinet Forest worked on the 1924 plantation in the Middle Fork and the 1919 plantation in the West Fork of Big Creek. All work was on areas of high priority.

Status of Work. Most of this year's eradication activities represented second and third workings. On extensive areas the number of ribes per acre has been reduced to a low figure. Additional workings are needed to place many of these areas on a maintenance basis. More area was placed in a maintenance status as a result of this season's work than has been possible for some time.

Surveys. With more qualified checkers available, it was possible to check practically all areas worked. In addition, post-check data were secured on many areas where this information was badly needed.

A wide use was made of the checker-flanker method, both as an eradication measure on areas with few ribes and as a means to determine the actual status of ground being considered for maintenance.

The disease survey work was expanded on all operations, but fell far short of supplying the amount of information needed. Pine stocking surveys were run on the St. Joe and Coeur d'Alene operations.

Needs. The following points are mentioned as the most pressing needs in facilitating the work in future years:

1. Adoption of the 48-hour week.
2. A nucleus of highly-skilled workers to work as individuals on areas of light ribes concentration.
3. A more mature and efficient class of labor.
4. An expansion of post check and disease surveys to furnish vital data to implement planning for future work.
5. A stabilized, consistent program, so that definite long-range plans can be worked out with confidence of ultimate consummation.

The statement of expenditures and costs is shown in the following tables by the cooperative agency and the type of appropriation:

TABLE 1

EXPENDITURES BY APPROPRIATIONS IN INLAND EMPIRE, 1946

Cooperating Agency	Appropriation	Amount
Bureau of Entomology & Plant Quarantine	Regular BLR-1-4	$ 72,522.67
	Regular BLR-3-4	415,879.93
	Subtotal	$ 488,402.60
State of Idaho Timber Protective Associations	State BLR-3-4	$ 14,943.35
	Private BLR-3-4	26,651.65
	Subtotal	$ 41,595.00
Forest Service	Regular BLR-4	$ 868,205.03
Total		$1,398,202.63

TABLE 2

CLASSIFIED EXPENDITURES IN INLAND EMPIRE, 1946

Item	Bureau of Entomology and Plant Quarantine				Forest Service	
	Regular BLR-1-4	Regular BLR-3-4	State and Private BLR-3-4	Total	Regular BLR-4	Total
Sal. perm. men	$54,048.53	$ 6,408.94		$ 60,457.47	$ 63,790.02	$ 124,247.49
Sal. temp. men	1,743.84	76,554.42	$ 4,128.32	82,426.58	77,841.71	160,268.29
Wages, temp. labs.	6,806.94	206,976.15	36,390.37	250,173.46	496,831.05	747,004.51
Subs. supplies	2,616.54	70,674.07	1,076.31	74,366.92	141,189.23	215,556.15
Equipment	9.85	15,861.15		15,871.00	39,647.27	55,518.27
Trucks		8,551.12		8,551.12		8,551.12
Travel & trans.	2,617.20	7,929.64		10,546.84	25,779.84	36,326.68
Other supplies	4,679.77	22,924.44		27,604.21	23,125.91	50,730.12
Total	$72,522.67	$415,879.93	$41,595.00	$529,997.60	$868,205.03	$1,398,202.63

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
INLAND EMPIRE

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
First	Burn	1945-49	243	548	111,750	2.26	460
	Cutover	1940-44	2,752	3,063	950,049	1.11	345
	Cutover	1920-39	1,366	2,601	229,334	1.90	168
	Reproduction	1910-39	2,021	7,635	1,034,668	3.78	512
	Pole		2,168	1,999	75,198	.92	35
	Mature		688	324	16,459	.47	24
	Miscellaneous		343	690	294,813	2.01	860
	Stream (1)		489	1,930	91,501	3.95	187
	Total		10,070	18,790	2,803,772	1.87	278
Second	Cutover	1940-44	80	74	4,208	.93	53
	Plantation	1940-44	426	471	7,137	1.11	17
	Cutover	1920-39	1,923	2,576	121,675	1.34	63
	Reproduction	1910-39	8,333	10,525	423,891	1.26	51
	Pole		10,573	3,166	128,403	.30	12
	Mature		612	486	14,611	.79	24
	Miscellaneous		248	123	2,329	.50	9
	Stream (2)		2,249	2,065	99,821	.92	44
	Total		24,444	19,486	802,075	.80	33
Third	Plantation	1940-44	211	35	1,258	.17	6
	Cutover	1920-39	5,780	5,810	345,274	1.01	60
	Reproduction	1910-39	9,231	13,770	268,466	1.49	29
	Pole		2,804	1,416	60,055	.50	21
	Mature		576	349	54,777	.61	95
	Miscellaneous		416	128	3,382	.31	8
	Stream (3)		2,153	3,314	132,551	1.54	62
	Total		21,171	24,822	865,763	1.17	41
All Workings	Burn	1945-49	243	548	111,750	2.26	460
	Cutover	1940-44	2,832	3,110	954,257	1.10	337
	Plantation	1940-44	637	506	8,395	.79	13
	Cutover	1920-39	9,069	10,987	696,283	1.21	77
	Reproduction	1910-39	19,585	31,930	1,727,025	1.63	88
	Pole		15,545	6,581	263,656	.42	17
	Mature		1,876	1,159	85,847	.62	46
	Miscellaneous		1,007	941	300,524	.93	298
	Stream (4)		4,891	7,309	323,973	1.49	66
	Total		55,685	63,071	4,471,610	1.13	80

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	26	82	1,576
(2)	20	39	521
(3)	1,536	2,247	9,417
(4)	1,582	2,368	11,514

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TABLE 4

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1946
INLAND EMPIRE

State	Working	Class	Acres	Man-Days	Ribes	Gallons Spray	Per Acre Man-Days	Per Acre Ribes
Idaho	First	EQ-Coop.	3,762	4,482	877,392	21	1.19	233
		FS-Reg.	2,441	3,804	772,107	755	1.56	316
		Total	6,203	8,286	1,649,499	776	1.34	266
	Second	EQ-Coop.	14,604	10,436	366,389	246	.71	25
		FS-Reg.	6,266	6,785	284,992		1.08	45
		Total	20,870	17,221	651,381	246	.83	31
	Third	EQ-Coop.	11,662	9,884	417,980	5,716	.85	36
		FS-Reg.	8,331	13,635	400,443	3,231	1.64	48
		Total	19,993	23,519	818,423	8,947	1.18	41
	All Workings	EQ-Coop.	30,028	24,802	1,661,761	5,983	.83	55
		FS-Reg.	17,038	24,224	1,457,442	3,986	1.42	86
		Total	47,066	49,026	3,119,203	9,969	1.04	66
Montana	First	FS-Reg.	2,386	6,637	265,130	800	2.78	111
	Second	FS-Reg.	182	369	23,158	275	2.03	127
	Third	FS-Reg.	391	518	19,914	470	1.38	51
	All Workings	FS-Reg.	2,959	7,524	308,202	1,545	2.54	104
Washington	First	FS-Reg.	1,481	3,840	889,143		2.59	600
	Second	FS-Reg.	3,392	1,896	127,636		.56	38
	Third	FS-Reg.	787	785	27,426		1.00	35
	All Workings	FS-Reg.	5,660	6,521	1,044,205		1.15	184
Total	First	EQ-Coop.	3,762	4,482	877,392	21	1.19	233
		FS-Reg.	6,308	14,281	1,926,380	1,555	2.26	305
		Total	10,070	18,763	2,803,772	1,576	1.86	278
	Second	EQ-Coop.	14,604	10,436	366,389	246	.71	25
		FS-Reg.	9,840	9,050	435,686	275	.92	44
		Total	24,444	19,486	802,075	521	.80	33
	Third	EQ-Coop.	11,662	9,884	417,980	5,716	.85	36
		FS-Reg.	9,509	14,938	447,783	3,701	1.57	47
		Total	21,171	24,822	865,763	9,417	1.17	41
	All Workings	EQ-Coop.	30,028	24,802	1,661,761	5,983	.83	55
		FS-Reg.	25,657	38,269	2,809,849	5,531	1.49	110
		Total	55,685	63,071	4,471,610	11,514	1.13	80

TABLE 5

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
INLAND EMPIRE

State	Working	Number of Acres Worked																
		By Forest Service					By Bureau of Entomology and Plant Quarantine					Total						
												Federal			Other			
		National Forest	Public Domain	State	Private	Total	National Forest	Public Domain	State	Private	Total	National Forest	Public Domain	Total	State	Private	Total	Total
Idaho	First	2,184			257	2,441	22		1,951	1,789	3,762	2,206		2,206	1,951	2,046	3,997	6,203
	Second	5,789		37	440	6,266	2,554	10	6,022	6,018	14,604	8,343	10	8,353	6,059	6,458	12,517	20,870
	Third	7,182	123	557	469	8,331	2,768	201	3,602	5,091	11,662	9,950	324	10,274	4,159	5,560	9,719	19,993
	Total	15,155	123	594	1,166	17,039	5,344	211	11,575	12,898	30,028	20,499	334	20,833	12,169	14,064	26,233	47,066
Montana	First	2,349			37	2,386						2,349		2,349		37	37	2,386
	Second	87			95	182						87		87		95	95	182
	Third	342			49	391						342		342		49	49	391
	Total	2,778			181	2,959						2,778		2,778		181	181	2,959
Washington	First	1,312			169	1,481						1,312		1,312		169	169	1,481
	Second	3,257			135	3,392						3,257		3,257		135	135	3,392
	Third	787				787						787		787				787
	Total	5,356			304	5,660						5,356		5,356		304	304	5,660
Total	First	5,845			463	6,308	22		1,951	1,789	3,762	5,867		5,867	1,951	2,252	4,203	10,070
	Second	9,133		37	670	9,840	2,554	10	6,022	6,018	14,604	11,687	10	11,697	6,059	6,688	12,747	24,444
	Third	8,311	123	557	518	9,509	2,768	201	3,602	5,091	11,662	11,079	324	11,403	4,159	5,609	9,768	21,171
	Total	23,289	123	594	1,651	25,657	5,344	211	11,575	12,898	30,028	28,633	334	28,967	12,169	14,549	26,718	55,685

TABLE 6

RIBES SPECIES ERADICATED, 1946
INLAND EMPIRE

Working	Eradication Type	Acres	Ribes Species						Total Ribes
			Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes inerme	Ribes irriguum	Ribes triste	
First	Burn (1945-49)	243	11,990	99,760					111,750
	Cutover (1940-44)	2,752	114,576	831,257	4,216				950,049
	Cutover (1920-39)	1,366	169,654	57,740	1,940				229,334
	Reproduction (1910-39)	2,021	461,759	572,889			20		1,034,668
	Pole	2,168	70,587	2,310	2,301				75,198
	Mature	688	15,518	941					16,459
	Miscellaneous	343	16,266	278,417		130			294,813
	Stream	489	78,043	3,451	7,820	836	1,351		91,501
	All Types	10,070	938,393	1,846,765	16,277	966	1,371		2,803,772
Second	Cutover (1940-44)	80	2,107	1,520	581				4,208
	Plantation (1940-44)	426	2,511	4,626					7,137
	Cutover (1920-39)	1,923	63,405	57,569	701				121,675
	Reproduction (1910-39)	8,333	323,486	76,174	823	23,323		35	423,891
	Pole	10,573	83,855	41,688	691	2,169			128,403
	Mature	612	12,846	1,755	10				14,611
	Miscellaneous	248	690	1,639					2,329
	Stream	2,249	65,170	437	6,505	27,709			99,821
	All Types	24,444	554,070	185,408	9,361	53,201		35	802,075
Third	Plantation (1940-44)	211	147	1,111					1,258
	Cutover (1920-39)	5,780	127,594	215,678	2,002				345,274
	Reproduction (1910-39)	9,231	147,494	119,042	1,930				268,466
	Pole	2,804	25,804	34,102	130	19			60,055
	Mature	576	13,878	40,899					54,777
	Miscellaneous	416	2,298	1,084					3,382
	Stream	2,153	35,600	2,815	90,456	1,054		2,626	132,551
	All Types	21,171	352,815	414,731	94,518	1,073		2,626	865,763
All Workings	Burn (1945-49)	243	11,990	99,760					111,750
	Cutover (1940-44)	2,832	116,683	832,777	4,797				954,257
	Plantation (1940-44)	637	2,658	5,737					8,395
	Cutover (1920-39)	9,069	360,653	330,987	4,643				696,283
	Reproduction (1910-39)	19,585	932,739	768,105	2,803	23,323	20	35	1,727,025
	Pole	15,545	180,246	78,100	3,122	2,188			263,656
	Mature	1,876	42,242	43,595	10				85,847
	Miscellaneous	1,007	19,254	281,140		130			300,524
	Stream	4,891	178,813	6,703	104,781	29,599	1,351	2,626	323,873
	All Types	55,685	1,845,278	2,446,904	120,156	55,240	1,371	2,661	4,471,610

TABLE 7

SUMMARY OF RIBES ERADICATION, 1923-1946
INLAND EMPIRE

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre		Net Acreage Remaining	
						Man-Days	Ribes	Worked	Unworked
First	Burn	1945-49	243	548	111,750	2.26	460	243	
	Plantation	1945-49	989	545	16,607	.55	17	989	473
	Cutover	1945-49							3,758
	Cutover	1940-44	9,555	12,017	5,004,528	1.26	524	9,555	126,436
	Burn	1940-44	926	535	100,985	.58	109	926	246
	Plantation	1940-44	5,892	8,232	2,183,197	1.40	371	5,892	227
	Cutover	1920-39	84,079	82,031	24,677,704	.98	294	79,682	243,502
	Reproduction	1910-39	602,368	677,446	182,936,952	1.12	304	591,907	165,061
	Pole		363,891	155,334	28,003,242	.43	77	359,242	94,671
	Mature		708,405	298,652	63,253,113	.42	89	546,414	191,287
	Miscellaneous		36,819	32,379	8,405,919	.88	228	34,114	9,790
	Stream (1)		124,458	313,514	64,639,421	2.52	519	123,478	24,207
	Total		1,937,625	1,581,233	379,333,418	.82	196	1,752,442	859,658
Second	Cutover	1940-44	432	273	11,315	.63	26	432	
	Plantation	1940-44	4,452	4,221	252,823	.95	57	4,452	
	Cutover	1920-39	54,147	60,334	13,149,748	1.11	243	54,147	
	Reproduction	1910-39	185,173	224,666	22,097,077	1.21	119	183,456	
	Pole		91,545	51,377	4,564,107	.56	50	90,818	
	Mature		43,296	27,652	2,972,347	.64	69	39,326	
	Miscellaneous		4,446	5,298	882,709	1.19	199	4,446	
	Stream (2)		58,120	89,753	12,099,170	1.54	208	57,729	
	Total		441,611	463,574	56,029,296	1.05	127	434,806	
Third	Plantation	1940-44	966	1,254	64,912	1.30	67	966	
	Cutover	1920-39	23,871	28,415	1,891,523	1.19	79	23,871	
	Reproduction	1910-39	57,040	81,284	3,356,315	1.43	59	56,433	
	Pole		11,108	7,090	439,063	.64	40	11,108	
	Mature		3,080	2,488	272,218	.81	88	3,080	
	Miscellaneous		976	467	30,828	.48	32	976	
	Stream (3)		18,652	28,041	2,546,372	1.50	137	18,652	
	Total		115,693	149,039	8,601,231	1.29	74	115,086	
Total	Burn	1945-49	243	548	111,750	2.26	460	243	
	Plantation	1945-49	989	545	16,607	.55	17	989	
	Cutover	1940-44	9,987	12,290	5,015,843	1.23	502	9,987	
	Burn	1940-44	926	535	100,985	.58	109	926	
	Plantation	1940-44	11,310	13,707	2,500,932	1.21	221	11,310	
	Cutover	1920-39	162,097	170,780	39,718,975	1.05	245	157,700	
	Reproduction	1910-39	844,581	983,396	208,390,344	1.16	247	831,796	
	Pole		466,544	213,801	33,006,412	.46	71	461,168	
	Mature		754,781	328,792	66,497,678	.44	88	588,820	
	Miscellaneous		42,241	38,144	9,319,456	.90	221	39,536	
	Stream (4)		201,230	431,308	79,284,963	2.14	394	199,859	
	Total		2,494,929	2,193,846	443,963,945	.88	178	2,302,334	

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	23,164	54,908	1,523,656
(2)	9,318	13,291	243,315
(3)	3,654	4,725	52,137
(4)	36,136	72,924	1,819,108

TABLE 8

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1923-1946
INLAND EMPIRE

State	Class	Gross Acres	Effective Man-Days	Total Ribes	Gallons Spray	Per Acre Basis Man-Days	Per Acre Basis Ribes
Idaho	EQ-Reg.	48,984	20,468	5,042,300	79,864	.42	103
	EQ-Coop.	240,709	144,741	22,869,647	205,019	.60	95
	EQ-Emerg.	514,942	404,100	96,874,569	213,935	.78	188
	FS-Reg.	429,809	470,191	83,318,036	463,205	1.09	194
	FS-Emerg.	337,869	216,240	56,636,775	125,491	.64	168
	CCC	590,414	661,693	123,729,240	657,303	1.12	210
	Total	2,162,727	1,917,433	388,470,567	1,744,817	.89	180
Montana	EQ-Reg.	2,002	3,295	761,710	34,795	1.65	380
	EQ-Emerg.	66,076	30,787	5,775,415	1,330	.47	87
	FS-Reg.	37,792	46,693	4,183,558	10,203	1.24	111
	FS-Emerg.	35,712	35,620	7,367,723	21,638	1.00	206
	CCC	14,475	12,440	1,472,009	6,325	.86	102
	Total	156,057	128,835	19,560,415	74,291	.83	125
Washington	EQ-Emerg.	64,757	63,140	17,825,782		.98	275
	FS-Reg.	52,694	45,347	10,606,688		.86	201
	FS-Emerg.	36,366	14,386	4,013,260		.40	110
	CCC	22,328	24,705	3,487,233		1.11	156
	Total	176,145	147,578	35,932,963		.84	204
Idaho Montana Washington	EQ-Reg.	50,986	23,763	5,804,010	114,659	.47	114
	EQ-Coop.	240,709	144,741	22,869,647	205,019	.60	95
	EQ-Emerg.	645,775	498,027	120,475,766	215,265	.77	187
	FS-Reg.	520,295	562,231	98,108,282	473,408	1.08	189
	FS-Emerg.	409,947	266,246	68,017,758	147,129	.65	166
	CCC	627,217	698,838	128,688,482	663,628	1.11	205
	Total	2,494,929	2,193,846	443,963,945	1,919,108	.88	178

TABLE 9

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1923-1946
INLAND EMPIRE

State	Ownership	Net Acres in Control Area: Acres Worked First	Acres Worked Second	Acres Worked Third	Acres Worked Total	Acres Unworked	Total Acres
Idaho	National Forest	849,649	218,753	49,805	1,118,207	259,666	1,109,315
	Public Domain	16,362	5,930	1,690	23,982	12,692	29,054
	Subtotal Federal	866,011	224,683	51,495	1,142,189	272,358	1,138,369
	State	229,109	58,121	18,711	305,941	119,118	348,227
	Private	412,968	101,313	28,275	542,556	355,100	769,068
	Subtotal Other	642,077	159,434	46,986	848,497	474,218	1,116,295
	Total	1,508,088	384,117	98,481	1,990,686	746,576	2,254,664
Montana	National Forest	114,961	9,828	3,056	127,845	58,295	173,256
	Public Domain	40			40		40
	Subtotal Federal	115,001	9,828	3,056	127,885	58,295	173,296
	State	734	1		735	173	907
	Private	18,995	2,374	1,840	23,209	14,855	33,850
	Subtotal Other	19,729	2,375	1,840	23,944	15,028	34,757
	Total	134,730	12,203	4,896	151,829	73,323	208,053
Washington	National Forest	86,047	26,992	7,028	120,067	34,601	120,648
	Public Domain	315	60		375		315
	Subtotal Federal	86,362	27,052	7,028	120,442	34,601	120,963
	State	6,832	3,935	2,114	12,881	988	7,820
	Private	16,430	7,499	2,567	26,496	4,170	20,600
	Subtotal Other	23,262	11,434	4,681	39,377	5,158	28,420
	Total	109,624	38,486	11,709	159,819	39,759	149,383
Total	National Forest	1,050,657	255,573	59,889	1,366,119	352,562	1,403,219
	Public Domain	16,717	5,990	1,690	24,397	12,692	29,409
	Subtotal Federal	1,067,374	261,563	61,579	1,390,516	365,254	1,432,628
	State	236,675	62,057	20,825	319,557	120,279	356,954
	Private	448,393	111,186	32,682	592,261	374,125	822,518
	Subtotal Other	685,068	173,243	53,507	911,818	494,404	1,179,472
	Total	1,752,442	434,806	115,086	2,302,334	859,658	2,612,100

BLISTER RUST CONTROL WORK, CLEARWATER OPERATION, 1946

By
F. J. Heinrich, Operation Supervisor
H. J. Faulkner, Assistant Operation Supervisor
B. C. Amsbaugh, Forest Officer

INTRODUCTION

The control area on the Clearwater operation comprises 488,000 acres of white pine type of which 205,000 acres fall within the national forest boundary and the remaining 283,000 acres lie within the boundaries of the Clearwater Timber Protective Association. The total area includes 43 per cent mature, 7 per cent pole, 15 per cent reproduction, 21 per cent cutover and 14 per cent stream and minor eradication types.

During the 18 years of ribes eradication work, 353,324 acres have been given first working, 107,900 acres second and 23,213 acres third. Out of the total area covered, approximately 90,000 acres have been placed in the maintenance classification.

ORGANIZATION AND ADMINISTRATION

Organization of field activities was the same as during the 1945 season with no change in previous working agreements with cooperating agencies.

Blister rust control field organization for the 1946 season was as follows:

Bureau of Entomology and Plant Quarantine	U. S. Forest Service
F. J. Heinrich, Operation Supervisor	B. C. Amsbaugh, Forest Officer
H. J. Faulkner, Assistant Operation Supervisor	Ray Van Dusen, Unit Supervisor
John C. Gonyou, Checker Foreman	
Charles W. Long, Unit Supervisor	
George A. Meyer, Unit Supervisor	

Program	Number Camps	Number Workers	Number Checkers
E.Q.-Cooperative	7	295	4
F.S.-Regular	5	185	3

Total workers employed on blister rust control 480.

First camp was established on May 20 and the last camp occupied June 23. All student camps were closed by September 15 while the Mexican crews worked until September 20.

LOCATION AND DESCRIPTION OF AREAS

Cooperative Camps on State and Private Land

Camp 110, Powder House, located T. 37 N., R. 5 E., sec. 27. This camp was located near the Powder House on a tributary of Quartz Creek. First working was

performed on an area logged in 1938-1939, located below the mouth of Quartz Creek. Ribes were comparatively light on the south and west slopes but numerous on the north-facing slopes. Second and third working was performed on adjacent areas which were cut in 1928 and 1930. Additional workings will be needed on the recent cutover area and spot working on the earlier cutover areas.

Camp 111, Rhodes Creek, located T. 36 N., R. 5 E., sec. 1. The work area lay along both sides of Rhodes Creek, extending down stream approximately two and one half miles from the national forest boundary. White pine mature was removed during the years 1940-1944. A five-chain belt of 60-year-old white pine pole remains along the main Rhodes Creek drainage. Ribes removed were 300 per acre from the cutover area. Future well-timed workings will be necessary in order to prevent serious damage to the pole stands and to the reproduction that is becoming established on the logged area.

Camp 112, Campbell's Pond, located T. 37 N., R. 5 E., sec. 18. This camp was located at Campbell's Pond on Poorman Creek. Ribes removed from sections 18 and 19 ran approximately 15 per acre. This was all second working on land cut over from 1930-1935. This area should carry through with a little future work along the streams. Working conditions were more difficult in sections 24 and 25 due to brush density and windfalls. An average of 400 ribes per acre was removed from these areas and additional future work will be necessary to afford protection. A fast spot working was given 175 acres in section 17 which is known as the Hollywood area.

Camp 113, Deer Creek, located T. 38 N., R. 5 E., sec. 13. When this area was cut over in 1935, a good white pine seed source was left. The area has been grazed each season by sheep. This resulted in a low, dense cover of brush. The area supports numerous small dwarf ribes which are difficult to eradicate. This dwarf bush problem is characteristic of many cutover areas on the Clearwater. Additional future work will be needed on part of the area before protection is established.

Camp 114, Bush Creek, located T. 39 N., R. 6 E., sec. 33. The work area lies in the upper end of the Schofield burn and was an extension of work done in 1944 and 1945. One more season's work remains to complete the second working on this area. Ribes removed averaged 225 per acre. Working conditions were difficult due to the density of brush and reproduction. Ribes petiolare was present on all stream type and was destroyed with chemical. Schofield area carries heavy blister rust infection and additional work will be necessary before the young pine is given protection.

Camp 115, Otter Creek, located T. 39 N., R. 6 E., sec. 35. Personnel from this camp worked in the lower part of the Schofield burn which is a portion of the same block as worked by Camp 114. The same working conditions prevailed. There remains one more season's work on Rettig Creek to complete second working on this area.

Camp 116, Reeds Creek, located T. 38 N., R. 5 E., sec. 26. This camp area lies between C.T.P.A. and the Summit Lookout. First working was performed on 334 acres of 1941 cutover land. The area supported numerous large R. viscosissimum

averaging 900 per acre. Second working was done on 132 acres, removing 45 ribes per acre. An average of two man-days per acre was expended on both first and second workings. It is contemplated to use chemicals applied by power sprayers on the remaining unworked upland area which supports large R. viscosissimum, averaging over a thousand per acre. Another season's work remains from this campsite.

Forest Service Camps on Federal Lands

Camp 171, Preacher Gulch, located T. 36 N., R. 6 E., sec. 6. Most of the ribes eradication work was first working on lands cut over from 1940-1945. A portion of the area lying in T. 37 N., R. 6 E., was rework on lands cut over during the period 1920-1929. The area as a whole still supports an adequate stocking of white pine reproduction and pole. With the exception of stream bottoms, which supported a heavy population of ribes, little future work will be required to afford protection from blister rust.

Camp 172, Orogrande Creek, located T. 37 N., R. 7 E., sec. 23. Ribes were removed from the upland and stream types on Tama and lower Tamarack Creek drainages. Working conditions in the reproduction areas were difficult due to the density of reproduction and brush. It is believed that this area is protected although future periodic inspections will be needed.

Camp 173, Sylvan Creek, located T. 37 N., R. 7 E., sec. 3. Work was performed on plantations established in 1939 and 1940 and on areas of natural white pine reproduction and pole in Sylvan Creek. Protection has been established on the areas supporting pole and reproduction. The plantation is now in satisfactory condition; however, periodic inspections will be needed during the next few years to locate any areas requiring additional work.

Camp 174, Three Bear, located T. 37 N., R. 7 E., sec. 33. Work area lies in Tamarack Creek drainage. A small area in the upper portion is white pine reproduction. Windfalls and brush density made difficult working conditions. The remainder of the area is pole type and ribes were generally light. Only those portions of the area supporting numerous ribes were worked intensively, the balance being worked by the flanking method. The area is now in satisfactory condition and very little additional work will be needed prior to harvesting.

Camp 175, Moose Creek, located T. 40 N., R. 11 E., sec. 31. Approximately half of the 653 acres of the pole type was given second working and the remainder initial. Ribes were generally light with 33 ribes per acre eradicated from the initial work area and 13 ribes per acre from the area given second working. Ribes appeared mainly within the stream zone and a belt along the ridge tops. Intensive working was given only part of the area, and the flanker method used on the remainder. One more working will be necessary to establish protection.

METHODS AND EQUIPMENT

Standard eradication methods were used throughout the season. The type of method used was dependent on type of area to be worked and quality of men available. Ammate and 2,4-D were used for the first time as ribicides on stream type ribes.

SURVEYS AND STATUS OF CONTROL

Pine Disease Survey

Pine disease survey was run where definite disease information was needed. A systematic survey method was used, running strips every five chains. Disease information was obtained by examining five trees at the end of each chain with the exception of the Hollywood area where ten trees were examined. Data on year of origin were recorded back to 1936. Trees were classed as fatally infected if they had a trunk canker or a limb canker within eight to twelve inches from the trunk, depending upon the size of limb. If a healthy tree occurred within eight feet of an infected one, no damage to stocking was figured. Ribes data were also taken along the entire strip. On some areas overwood was recorded every ten chains.

Results of the 1946 pine disease survey are shown in the following table:

PINE DISEASE SURVEY SUMMARY, 1946

Name	T	R	S	No. Trees Exam-ined	Trees Infected		Trees with Killing Cankers		Stocking Trees Fatally Infected	Ht. of Trees
					No.	Per cent	Number	Per cent		
Hollywood	37N	5E	17	7,312	1,280	17	1,183	16	83	3-12'
Hollywood	37N	5E	9	648	150	23	140	22	14	3-12'
Schofield	39N	6E	35 33,34	985	646	65	526	53	379	1-20'
Flat Creek	36N	5E	9	2,038	215	10	206	10	25	1- 4'
Three Mile	37N	5E	34	870	269	31	204	23	42	3-11'
Jaype	37N	5E	21,28 14	1,071	194	18	121	11	4	3-12'
Orofino Cr.Lkt.	36N	4E	11,13	223	43	19	28	13	9	15-30'
Grasshopper Cr.	36N	5E	21,28	930	110	12	107	12	6	1- 6'
Camp "C"	38N 37	4E 5	2,3,10 29,31,6	316	212	67	196	62	94	3-15'
Reeds Cr.	38N	6E	35,36 30,32	213	112	53	110	51	41	1- 3'
Mussellshell	36N	6E	22	577	237	41	195	34	53	3-12'

Schofield and Camp "C" areas are the most heavily infected of any work areas on the operation. Considerable damage has already occurred as the original stocking on these two areas was medium to poor. Loss to stocking can definitely be attributed to lack of follow-up work due to an inadequate work program. In the Schofield area, first working was done in 1934, 1935 and 1936. Second working did not get underway until 1944 which was at least seven years too late. A similar situation occurred in the Camp "C" area. Unless rework is performed on schedule, damage must be expected on work areas.

The Hollywood area in T. 37 N., R. 5 E., sec. 17, shows the results of the proper application of blister rust control measures. This area was logged in 1934-1935. The area now supports an excellent stand of reproduction which has successfully withstood the 1937 and 1941 infection waves. Although some additional work will be necessary, no particular difficulty is anticipated in establishing permanent control. Other than the Camp "C" area which was logged in 1929-1930, no cutover work area has been seriously damaged by blister rust.

Control Status

The general status of control work on the Clearwater National Forest remains favorable. A yearly control program of approximately 300 capable workers for the next five years should place the majority of pole and reproduction areas on a maintenance basis. This program would also take care of present cutover areas.

On the Clearwater Timber Protective Association, a more difficult control problem exists. This is a result of the large acreage that is being converted from protected mature to cutover areas which will require from two to three workings. Cutover areas, as a whole, are being left in a satisfactory condition for the re-establishment of a white pine stand.

The future success of control work will be dependent upon an adequate yearly program. The size will depend materially upon the acreage of mature timber that will be cut in the future. It appears that 500 workers yearly for the next five years can bring the control program up to date on Association lands.

Checking

The checking organization consisted of three Forest Service and four Bureau checkers. Three of the group were veterans, one having previous checking experience. The others were teen-age workers who had at least two seasons' ribes eradication experience. The veterans worked out best because of their broader experience and maturity. All worked under the direct supervision of the checker foreman.

All areas were given a regular check with the exception of some pole areas that were worked late in the season by the checker flanker method. A check on these areas this coming season will be of much more value than any check that could have been run the current season.

In addition to the regular checking, 5,814 acres were covered in an advance check and 5,454 acres by post check. Most of the advance check was done on unworked cutover (1940-1945) while the post check was performed on cutover (1920-1939) areas.

The results of the final check showed that approximately 90 per cent of the current season's eradication work was acceptable under the recognized standards of efficiency.

1947 CHECKING RESULTS

Camp No.	Chains Run	Bushes	Feet Live Stem	Per Acre Basis No. Bushes	F.L.S.
Bureau of Entomology and Plant Quarantine					
110	427	113	170	13	20
111	1,285	511	541	20	21
112	2,820	102	229	2	4
113	2,190	303	815	7	18
114	764	54	199	4	13
115	861	81	387	5	22
116	614	227	690	18	57
All	8,961	1,391	3,031	8	17
Forest Service					
171	1,935	202	349	5	9
172	858	91	388	5	23
173	1,014	42	121	2	6
All	3,807	335	858	4	11

Advance check 5,814 acres
Post check 5,454 acres

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs is shown in the following tables by the cooperative agency and the type of appropriation.

TABLE 1

EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
CLEARWATER OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 14,721.74
	Regular BLR-3-4	131,747.08
	Subtotal	$146,468.82
State of Idaho Clearwater Timber Protective Association	State BLR-3-4	$ 2,996.88
	Private BLR-3-4	10,741.97
	Subtotal	$ 13,738.85
Forest Service	Regular BLR-4	$109,209.74
Total		$269,417.41

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
CLEARWATER OPERATION

Item	Bureau of Entomology and Plant Quarantine				Forest Service	Total
	Regular BLR-1-4	Regular BLR-3-4	State and Private BLR-3-4	Total	Regular BLR-4	
Sal. perm. men	$11,693.05	$ 980.33		$ 12,673.38	$ 5,639.96	$ 18,313.34
Sal. temp. men	402.23	27,694.83	$ 1,730.69	29,827.75	15,209.90	45,037.65
Wages, temp.labs.	763.80	62,090.09	11,666.97	74,520.86	64,842.22	139,363.08
Subs. supplies		23,649.08	341.19	23,990.27	14,776.86	38,767.13
Equipment		4,985.76		4,985.76	3,352.35	8,338.11
Trucks		2,850.37		2,850.37		2,850.37
Travel & transp.	583.32	2,124.42		2,707.74	2,409.15	5,116.89
Other Supplies	1,279.34	7,372.20		8,651.54	2,979.30	11,630.84
Total	$14,721.74	$131,747.08	$13,738.85	$160,207.67	$109,209.74	$269,417.41

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
CLEARWATER OPERATION

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre	
						Man-Days	Ribes
First	Cutover	1940-44	2,354	2,724	759,217	1.16	323
	Cutover	1920-39	449	1,177	77,469	2.62	173
	Pole		329	352	10,901	1.07	33
	Total		3,132	4,253	847,587	1.36	271
Second	Cutover	1940-44	80	74	4,208	.93	53
	Cutover	1920-39	1,326	1,245	44,966	.94	34
	Reproduction	1910-39	1,070	2,412	131,280	2.25	123
	Pole		1,226	195	5,911	.16	5
	Mature		266	182	3,833	.68	14
	Total		3,968	4,108	190,198	1.04	48
Third	Cutover	1920-39	1,495	1,343	149,631	.90	100
	Reproduction	1910-39	735	1,642	65,070	2.23	89
	Pole		1,177	755	13,909	.64	12
	Stream (3)		68	101	6,641	1.49	98
	Total		3,475	3,841	235,251	1.11	68
All Workings	Cutover	1940-44	2,434	2,798	763,425	1.15	314
	Cutover	1920-39	3,270	3,765	272,066	1.15	83
	Reproduction	1910-39	1,805	4,054	196,350	2.25	109
	Pole		2,732	1,302	30,721	.48	11
	Mature		266	182	3,833	.68	14
	Stream (4)		68	101	6,641	1.49	98
	Total		10,575	12,202	1,273,036	1.15	120

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)			114
(3)	68	101	1,132
(4)	68	101	1,246

TABLE 4

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1946
CLEARWATER OPERATION

State	Working	Class	Acres	Man-Days	Ribes	Gallons Spray	Per Acre	
							Man-Days	Ribes
Idaho	First	EQ-Coop.	1,813	2,951	704,653	21	1.63	389
		FS-Reg.	1,319	1,302	142,934	93	.99	108
		Total	3,132	4,253	847,587	114	1.36	271
	Second	EQ-Coop.	2,223	3,219	175,768		1.45	79
		FS-Reg.	1,745	889	14,430		.51	8
		Total	3,968	4,108	190,198		1.04	48
	Third	EQ-Coop.	1,563	1,444	156,272	1,132	.92	100
		FS-Reg.	1,912	2,397	78,979		1.25	41
		Total	3,475	3,841	235,251	1,132	1.11	68
	All Workings	EQ-Coop	5,599	7,614	1,036,693	1,153	1.36	185
		FS-Reg.	4,976	4,588	236,343	93	.92	47
		Total	10,575	12,202	1,273,036	1,246	1.15	120

TABLE 5

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
CLEARWATER OPERATION

State	Working	Acres Worked											
		By Forest Service			By Bureau of Entomology and Plant Quarantine				Total				
									Federal	Other			
		National Forest	Private	Total	National Forest	State	Private	Total	National Forest	State	Private	Total	Total
Idaho	First	1,131	188	1,319		464	1,349	1,813	1,131	464	1,537	2,001	3,132
	Second	1,745		1,745	80	327	1,816	2,223	1,825	327	1,816	2,143	3,968
	Third	1,912		1,912	83	148	1,332	1,563	1,995	148	1,332	1,480	3,475
	Total	4,788	188	4,976	163	939	4,497	5,599	4,951	939	4,685	5,624	10,575

TABLE 6

RIBES SPECIES ERADICATED, 1946
CLEARWATER OPERATION

Working	Eradication Type	Acres	Ribes Species				Total Ribes
			Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes triste	
First	Cutover (1940-44)	2,354	85,673	669,328	4,216		759,217
	Cutover (1920-39)	449	18,829	56,700	1,940		77,469
	Pole	329	8,598	2	2,301		10,901
	All Types	3,132	113,100	726,030	8,457		847,587
Second	Cutover (1940-44)	80	2,107	1,520	581		4,208
	Cutover (1920-39)	1,326	9,015	35,271	680		44,966
	Reproduction (1910-39)	1,070	129,234	1,320	691	35	131,280
	Pole	1,226	4,955	327	629		5,911
	Mature	266	2,420	1,403	10		3,833
	All Types	3,968	147,731	39,841	2,591	35	190,198
Third	Cutover (1920-39)	1,495	6,791	140,854	1,986		149,631
	Reproduction (1910-39)	735	45,208	18,214	1,648		65,070
	Pole	1,177	4,431	9,478			13,909
	Stream	68	1,854	1,138	3,649		6,641
	All Types	3,475	58,284	169,684	7,283		235,251
All Workings	Cutover (1940-44)	2,434	87,780	670,848	4,797		763,425
	Cutover (1920-39)	3,270	34,635	232,825	4,606		272,066
	Reproduction (1910-39)	1,805	174,442	19,534	2,339	35	196,350
	Pole	2,732	17,984	9,807	2,930		30,721
	Mature	266	2,420	1,403	10		3,833
	Stream	68	1,854	1,138	3,649		6,641
	All Types	10,575	319,115	935,555	18,331	35	1,273,036

TABLE 7

SUMMARY OF RIBES ERADICATION, 1929-1946
CLEARWATER OPERATION

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre		Net Acreage Remaining	
						Man-Days	Ribes	Worked	Unworked
First	Cutover	1945-49							1,840
	Cutover	1940-44	5,341	8,773	4,450,070	1.64	833	5,341	29,868
	Plantation	1940-44	60	232	134,749	3.87	2,246	60	
	Cutover	1920-39	37,708	38,899	13,566,785	1.03	360	33,885	31,496
	Reproduction	1910-39	71,329	108,331	33,428,751	1.52	469	70,613	4,248
	Pole		30,254	17,489	3,839,237	.58	127	28,945	6,002
	Mature		219,289	99,880	23,422,354	.46	107	166,711	39,728
	Miscellaneous		5,852	3,900	1,700,804	.67	291	5,416	7,819
	Stream (1)		42,353	78,124	14,058,124	1.84	332	42,353	13,675
	Total		412,186	355,628	94,600,924	.86	230	353,324	134,676
Second	Cutover	1940-44	80	74	4,208	.93	53	80	
	Plantation	1940-44	60	194	15,587	3.23	260	60	
	Cutover	1920-39	30,258	29,414	8,219,075	.97	272	30,258	
	Reproduction	1910-39	24,532	38,423	3,649,880	1.57	149	24,456	
	Pole		15,221	8,087	1,116,703	.53	73	14,582	
	Mature		16,333	7,983	815,665	.49	50	14,173	
	Miscellaneous		511	573	371,107	1.12	726	511	
	Stream (2)		23,780	26,966	3,329,143	1.13	140	23,780	
	Total		110,775	111,714	17,521,368	1.01	158	107,900	
Third	Cutover	1920-39	12,327	13,711	1,071,727	1.11	87	12,327	
	Reproduction	1910-39	6,381	9,340	444,286	1.46	70	6,381	
	Pole		1,177	755	13,909	.64	12	1,177	
	Stream (3)		3,328	3,773	335,748	1.13	101	3,328	
	Total		23,213	27,579	1,865,670	1.19	80	23,213	
All Workings	Cutover	1940-44	5,421	8,947	4,454,278	1.63	822	5,421	
	Plantation	1940-44	120	426	150,336	3.55	1,253	120	
	Cutover	1920-39	80,293	82,024	22,857,587	1.02	285	76,470	
	Reproduction	1910-39	102,242	156,094	37,522,917	1.53	367	101,450	
	Pole		46,652	26,331	4,969,899	.56	107	44,704	
	Mature		235,622	107,863	24,238,019	.46	103	180,884	
	Miscellaneous		6,363	4,473	2,071,911	.70	326	5,927	
	Stream (4)		69,461	108,363	17,723,015	1.57	255	69,461	
	Total		545,174	494,921	113,987,962	.91	209	484,437	

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	15,027	31,191	794,598
(2)	5,875	8,142	119,985
(3)	818	1,296	19,795
(4)	21,720	40,529	934,378

TABLE 8

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1929-1946
CLEARWATER OPERATION

State	Class	Gross Acres	Man-Days	Total Ribes	Gallons Spray	Per Acre	
						Man-Days	Ribes
Idaho	EQ-Reg.	4,412	5,273	1,129,228	79,864	1.20	256
	EQ-Coop.	49,365	46,158	6,793,408	140,075	.94	138
	EQ-Emerg.	133,970	125,277	30,398,093	136,847	.94	227
	FS-Reg.	115,037	106,963	28,530,568	144,980	.93	248
	FS-Emerg.	55,908	45,382	14,895,022	24,015	.81	266
	CCC	187,482	165,868	32,241,643	408,597	.88	172
	Total	546,174	494,921	113,987,962	934,378	.91	209

TABLE 9

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1929-1946
CLEARWATER OPERATION

State	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Idaho	National Forest	151,457	51,540	8,768	211,765	48,895	200,352
	Public Domain	3,680	708	12	4,400	350	4,030
	Subtotal Federal	155,137	52,248	8,780	216,165	49,245	204,382
	State	61,258	13,900	1,470	76,628	29,000	90,258
	Private	136,929	41,752	12,963	191,644	56,431	193,360
	Subtotal Other	198,187	55,652	14,433	268,272	85,431	283,618
	Total	353,324	107,900	23,213	484,437	134,676	488,000

BLISTER RUST CONTROL WORK, ST. JOE OPERATION, 1946

By
H. J. Hartman, Operation Supervisor
D. J. Moore, Forester, U. S. Forest Service
W. F. Painter, Assistant Operation Supervisor
M. D. Oaks, Forester, U. S. Forest Service
Robert H. Kliewer, Unit Supervisor

INTRODUCTION

Blister rust control work was continued on the St. Joe operation for the eighteenth consecutive year. The operation comprises 884,925 acres of western white pine type in the St. Joe National Forest and Potlatch Timber Protective Association. Of the total area 29 per cent is cutover, 31 per cent reproduction, 16 per cent pole, 23 per cent mature, and 1 per cent miscellaneous types.

At the close of the 1946 field season 481,998 acres had been worked initially, 147,297 acres worked the second time, and 44,516 acres three or more times. About 49 per cent of the control area is on a maintenance basis or in a sufficiently satisfactory status to be brought through to maturity under the present program. The remaining 51 per cent of the control area is not being adequately protected with the present rate of progress. On this area nearly a complete loss will be sustained unless the control program is greatly increased. White pine reproduction and young pole have already been lost on 11 per cent of the control area.

ORGANIZATION AND ADMINISTRATION

Control activities on the St. Joe operation were organized in accordance with agreements between federal, state, and private agencies. Personnel of the Bureau of Entomology and Plant Quarantine provided assistance in the over-all planning, coordination, and technical direction of the program on lands of all ownerships. The Bureau also administered the cooperative control program, consisting of seven camps. Four of the cooperative camps were located within the Association boundaries and worked on state and private lands in the Oviat, Cameron, and West Fork of Potlatch drainages. Three Bureau camps, financed entirely with federal funds for work on lands of intermingled ownership, were located in the St. Maries River drainage near Clarkia, Idaho. The Forest Service financed and administered the work of eight camps on National Forest lands. The work season averaged slightly over two months per camp. The labor was mostly high school students and Mexican Nationals.

A checking supervisor from the Bureau was in charge of all checking, and also assisted in the technical supervision of all camps.

Ribes eradication work in all Forest Service camps was interrupted by forest-fire calls throughout the month of August. Such interruptions result in labor turnover and greatly increased blister rust control costs.

The blister rust control 1946 field organization was as follows:

Bureau of Entomology and Plant Quarantine	U. S. Forest Service
H. J. Hartman, Operation Supervisor	D. J. Moore, Forest Officer
W. F. Painter, Assistant Operation Supervisor	M. D. Oaks, Forest Officer
R. H. Kliewer, Unit Supervisor	K. G. Reinhart, Forest Officer
	Clyde Miller, Checker Foreman
	F. A. Moore, Unit Supervisor
	H. W. Seaman, Unit Supervisor
	C. A. Schwartz, Unit Supervisor

Program	Number Camps	Number Workers	Number Checkers
E.Q. - Cooperative	7	320	4
F.S. - Regular	8	*400	6

Total number employed on blister rust control - 720

*120 were Mexican Nationals.

Field headquarters at Clarkia, Idaho, maintained by the Bureau, was used as an operating base for all Bureau and some Forest Service activities. The warehousing and supplying of subsistence for Forest Service camps were handled through the Clarkia Ranger Station Warehouse.

Mexican Nationals were secured through the War Food Administration for blister rust control work in the Forest Service camps. One hundred twenty reported in early July and were transferred to the sugar beet fields in mid-September. Observations during the past three seasons have shown that Mexican Nationals are not particularly adaptable to ribes eradication work, especially on areas of light ribes concentrations. Accomplishments and quality of work are not comparable to that of regular crews. Work areas for Mexican Nationals were specially selected in order to obtain maximum accomplishments from that class of labor.

LOCATION AND DESCRIPTION OF AREAS

Drainage	T	R	S	Date Established	Date Closed	Class of Labor	Size
BUREAU - COOPERATIVE CAMPS							
Cameron Creek	40N	2E	32	May 20	Sept. 13	Students	66
Oviat Creek	39N	1E	2	May 28	Aug. 19	Students	45
Purdue Creek	41N	1E	18	June 3	July 31	Students	45
W. F. Potlatch Creek	41N	1W	23	June 10	Aug. 23	Students	45
Hidden Creek	42N	1E	27	May 22	Aug. 23	Students	66
Merry Creek	43N	2E	29	June 10	Aug. 14	Students	45
Graves Creek	42N	2E	26	June 10	Aug. 21	Students	45
FOREST SERVICE CAMPS							
Willow Creek	43N	2W	6	June 6	Aug. 26	Students	66
Charlie Creek	45N	2W	15	June 21	Aug. 11	Students	66
Charlie Creek	45N	2W	27	July 10	Sept. 25	Mexicans	33
Bechtel Creek	42N	1E	12	June 4	Aug. 28	Students	66
Feather Creek	41N	1W	1	June 12	Aug. 29	Students	66
Cats Spur Creek	42N	2E	19	June 18	July 31	Students	33
Norton Creek	44N	2E	35	July 7	Sept. 22	Mexicans	66
Toles Creek	44N	2E	26	July 10	Sept. 22	Mexicans	33

While blister rust infection on the St. Joe is very critical, there has been no appreciable amount of new pine infection since the very heavy wave in 1941. All control efforts were directed toward the protection of well-stocked reproduction and pole stands of western white pine on sites I and II. With one exception, all camps were engaged in second and third workings. The Merry, Norton, and Toles Creek camps spent nearly the entire season on third and fourth workings of stream type. The Willow and lower Charlie Creek camps worked in young plantations, while the upper Charlie Creek camp was engaged in first working of a very heavy ribes belt at the head of the drainage to expand the protection zone for the Charlie Creek plantation.

METHODS AND EQUIPMENT

In May a four-day training school was held for blister rust control supervisory personnel. A complete review of ribes eradication, first aid, and safety measures was presented. Straw bosses and crew men were given thorough training on the job. The present-day, inexperienced worker requires from eight to twelve days of training before he can do effective ribes eradication work. In the Bureau camps 28 per cent of all laborers employed quit during the training period. Personnel training and management consume about two-thirds of the time of the camp boss.

Using the flanker method, one four-man Bureau crew worked 956 acres of open and dense pole with an expenditure of 81 man-days. The four-man crew worked a strip two to three chains in width. The outside man ran the compass and laid the string line, which served as a guide line on the return strip.

Ammonium sulfamate was used on all stream-type areas supporting medium to heavy ribes, regardless of species, and was applied on Lines, Toles, Norton, Merry,

and Lower Charlie Creek as well as the East and West Fork of the St. Maries River. Ammonium sulfamate replaced Atlacide for all chemical ribes eradication in 1946, as it has the advantage of being effective on all species of ribes. Through the use of this chemical, the entire stream-type ribes eradication job is completed in one operation.

CHECKING

The lack of competent personnel available as trainees for checkers did not permit any appreciable increase of the 1946 checking organization. Three checkers from the 1945 season were available by mid-June. Seven additional students were trained during the field season. A checker foreman assisted in the training and supervision of the checkers.

The method of checking areas by working two checkers together along a check strip was continued, and the system seems very satisfactory, especially with the quality of labor available.

A total of 11,706 acres of area worked in 1946 was checked; 6,680 acres were post checked within and adjacent to 1946 camp areas. No check was made of any areas worked by Mexican labor, since one camp was engaged on first working with very heavy ribes, and the other two camps of Mexicans worked stream type.

SURVEYS

Pine Stocking Survey. An eight-man survey crew, financed from regular Forest Service funds, inspected 12,560 acres on the St. Joe Forest to secure needed information on the amount, distribution of white pine and associate species, site quality, and working conditions. A running count of the white pine along a 13.2-foot strip was tallied; and, in addition, the presence of white pine and associate species was tallied on a four-milacre quadrat at the end of every chain. Parallel strips were run at 10-chain intervals. The data supplemented prior random inspections of the areas and provided sufficient information to properly appraise the areas for future blister rust control work. The survey was conducted subsequent to the close of the ribes eradication season.

Disease Survey. A checker foreman, assisted by two checkers, inspected a number of areas on which disease survey data were needed. The inspections on the Middle Fork of Big Creek and Mowat Creek drainages were made by the permanent personnel.

The data for the various inspections are shown in the following summaries:

Hatton Creek, T. 43 N., R. 1 E., secs. 3, 4, and 9

Chains survey strip	367
Number trees examined	5,664
Number trees infected	153
Per cent of trees infected	4
Total number cankers	157
Per cent of infected trees with trunk cankers	5

Area planted spring 1940, first work 1940. Very heavy ribes. Area reworked in 1941. Disease survey 1943, 2 per cent infection. Third work on half the area by Mexican labor in 1945. Of 157 cankers examined in 1946, 34 on 1943 wood in pycnial stage. Remaining cankers were on 1941 and 1942 wood and had fruited at least once. No damage to present stocking. Additional rework will be necessary to place area in satisfactory status.

Mica Creek Area, T. 44 N., R. 2 E., secs. 5, 7, 8, and 17

Chains survey strip	297
Number trees examined	3,718
Number trees infected	2,215
Per cent of trees infected	59
Per cent of infected trees with trunk cankers	74

Reproduction 0-20, first work 1936-39-40. Portion of area worked in 1936 reworked in 1939. Total area on rework basis. Disease survey in 1943 on contiguous area showed 45 per cent infection. Seventy-five per cent of cankers on 1943 survey of 1937 origin or earlier. Damage to present stocking very heavy. Present values on the area and its present status do not warrant consideration in present program.

Charlie Creek Area, T. 43 N., R. 2 W., secs. 10, 15, 16, 21, and 22

Chains survey strip	396
Number trees examined	3,246
Number trees infected	153
Per cent of trees infected	5
Per cent of infected trees with trunk cankers	51

There are 1,368 acres of plantation in this area. Plantings made in fall of 1940 and spring of 1941. Scattered natural reproduction on the area 0-20. First work performed in 1941-1942, second work in 1946. Disease survey, 1941, 1.5 per cent infection. No new infection observed since heavy wave of 1941. All cankers observed in 1946 of 1937 and 1941 origin. Additional work will be necessary on the area to prevent future damage.

Willow Creek Area, T. 43 N., R. 3 W., secs. 12 and 13

Chains survey strip	158
Number trees examined	2,090
Number trees infected	118
Per cent of trees infected	6
Per cent of infected trees with trunk cankers	59

Plantation area. Plantings made in 1937-38-39-40. First work by CCC's in 1939. Reworked in 1941 by CCC's. Reworked in 1943 and 1946. No disease survey prior to 1946. Present cankers result of 1941 infection. Four cankers found on 1943 wood and 4 on 1944 wood. One more working should place area in satisfactory status.

Middle Fork Big Creek, T. 47 N., R. 3 E., secs. 27 and 34

Chains survey strip	31
Number trees examined	639
Number trees infected	526
Per cent of trees infected	82
Per cent of infected trees with trunk cankers	67

Plantation area. First planting in spring 1925, successive plantings in 1926-27-33. Very steep country. Plantations surrounded by heavy ribes. First work on area in 1932. Second work in 1939. Disease survey in 1939 indicated 5 per cent infection. Of cankers examined in 1946, 95 per cent result of 1941 infection. Remainder prior to 1941. No new infection since 1941. Damage to present stocking very heavy. Area in a rework status.

Mowat Creek Area, T. 46 N., R. 3 E., sec. 22

Chains survey strip	15
Number trees examined	167
Number trees infected	113
Per cent of trees infected	68
Per cent of infected trees with trunk cankers	85

Plantation area. Planted in spring of 1932. Area located in very steep and brushy country, completely surrounded by heavy ribes concentrations. First work in 1932-39. Second work in 1939. The first work in 1939 extended work area of 1932 to provide a wider protection zone. Disease survey in 1939 indicated 5 per cent infection over area. Of cankers examined in 1946, 95 per cent of 1941 origin. Plantation area relatively free of ribes, but heavy ribes concentrations exist beyond established protective zones.

Marble Creek and Tributaries, T. 44 N., R. 2 E., sec. 23, 24, 26, 27, 35
T. 44 N., R. 3 E., secs. 20 and 29

Chains survey strip	940
Number trees examined	8,789
Number trees infected	4,463
Per cent of trees infected	51
Per cent of infected trees with trunk cankers	34

Reproduction 0-20. Area, prior to initial eradication, possessed very heavy upland and stream type ribes. First work by regular crews in 1934. Second work in 1938 by W.P.A. confined to stream type. Second work on upland in 1939. Third work on very small portion of area in main Marble in 1941. Third work in 1944 on areas on Cranberry, Bussell, and Toles. In 1945, area not worked in 1944 worked by Mexican labor. In 1946 Mexican labor again used to rework the stream type and small portions of upland area not completed in 1945.

Infection was found on ribes in Marble Creek in 1926. By 1934 the rust was well established in the area due to very heavy concentrations of Ribes petiolare in the stream type. An extensive survey in 1938 indicated 30 per cent of the trees were infected. A survey in 1943 indicated 50 per cent of the trees were infected. A systematic survey in 1946 showed an average of 51 per cent of the trees infected.

A breakdown of the infection on the tributaries of Marble is shown below:

Lines Creek Area

Chains survey strip	25
Number trees examined	256
Number trees infected	145
Per cent of trees infected	57
Per cent of infected trees with trunk cankers	68

Norton Creek Area

Chains survey strip	55
Number trees examined	365
Number trees infected	255
Per cent of trees infected	70
Per cent of infected trees with trunk cankers	87

Toles Creek Area

Chains survey strip	86
Number trees examined	733
Number trees infected	524
Per cent of trees infected	71
Per cent of infected trees with trunk cankers	83

Bear Creek Area

Chains survey strip	188
Number trees examined	1,786
Number trees infected	771
Per cent of trees infected	43
Per cent of infected trees with trunk cankers	63

Bussell Creek Area

Chains survey strip	422
Number trees examined	4,016
Number trees infected	2,121
Per cent of trees infected	53
Per cent of infected trees with trunk cankers	71

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures is shown in the following tables by the cooperative agency and the type of appropriation:

TABLE 1

EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
ST. JOE OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 18,809.34
	Regular BLR-3-4	147,202.88
	Subtotal	$166,012.22
State of Idaho	State BLR-3-4	$ 4,682.00
Potlatch Timber Protective Association	Private BLR-3-4	8,944.30
	Subtotal	$ 13,626.30
Forest Service	Regular BLR-4	$223,578,59
Total		$403,217.11

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
ST. JOE OPERATION

Item	Bureau of Entomology and Plant Quarantine				Forest Service	
	Regular BLR-1-4	Regular BLR-3-4	State and Private BLR-3-4	Total	Regular BLR-4	Total
Sal. perm. men	$15,822.36	$ 4,627.84		$ 20,450.20	$ 15,580.52	$ 36,030.72
Sal. temp. men	82.78	23,398.36	$ 945.25	24,426.39	25,414.37	49,840.76
Wages, temp.labs.	76.43	77,251.78	12,522.16	89,850.37	116,765.55	206,615.92
Subs. supplies		24,244.05	158.89	24,402.94	39,058.39	63,461.33
Equipment		4,961.76		4,961.76	17,715.98	22,677.74
Trucks		2,850.37		2,850.37		2,850.37
Travel & transp.	716.78	2,287.63		3,004.41	5,500.86	8,505.27
Other supplies	2,110.99	7,581.09		9,692.08	3,542.92	13,235.00
Total	$18,809.34	$147,202.88	$13,626.30	$179,638.52	$223,578.59	$403,217.11

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
ST. JOE OPERATION

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre	
						Man-Days	Ribes
First	Reproduction	1910-39	300	1,174	410,320	3.91	1,368
	Stream (1)		21	102	14,869	4.86	708
	Total		321	1,276	425,189	3.98	1,325
Second	Plantation	1940-44	398	425	2,805	1.07	7
	Cutover	1920-39	56	120	7,250	2.14	129
	Reproduction	1910-39	2,411	3,525	72,534	1.46	30
	Pole		241	13	271	.05	1
	Stream (2)		16	71	2,834	4.44	177
	Total		3,122	4,154	85,694	1.33	27
Third	Cutover	1920-39	1,555	1,803	53,438	1.16	34
	Reproduction	1910-39	5,690	9,217	122,766	1.62	22
	Pole		1,055	397	4,233	.38	4
	Stream (3)		1,756	2,686	96,313	1.53	55
	Total		10,056	14,103	276,750	1.40	28
All Workings	Plantation	1940-44	398	425	2,805	1.07	7
	Cutover	1920-39	1,611	1,923	60,688	1.19	38
	Reproduction	1910-39	8,401	13,916	605,620	1.66	72
	Pole		1,296	410	4,504	.32	3
	Stream (4)		1,793	2,859	114,016	1.59	64
	Total		13,499	19,533	787,633	1.45	58

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	16	50	662
(2)	16	30	246
(3)	1,458	2,102	7,815
(4)	1,490	2,182	8,723

TABLE 4

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1946
ST. JOE OPERATION

State	Working	Class	Acres	Man-Days	Ribes	Gallons Spray	Per Acre	
							Man-Days	Ribes
Idaho	First	EQ-Coop.	59	162	76,320		2.75	1,294
		FS-Reg.	262	1,114	348,869	662	4.25	1,332
		Total	321	1,276	425,189	662	3.98	1,325
	Second	EQ-Coop.	1,968	2,170	45,778	246	1.10	23
		FS-Reg.	1,154	1,984	39,916		1.72	35
		Total	3,122	4,154	85,694	246	1.33	27
	Third	EQ-Coop.	6,123	6,615	129,593	4,584	1.08	21
		FS-Reg.	3,933	7,488	147,157	3,231	1.90	37
		Total	10,056	14,103	276,750	7,815	1.40	28
	All Workings	EQ-Coop.	8,150	8,947	251,691	4,830	1.10	31
		FS-Reg.	5,349	10,586	535,942	3,893	1.98	100
		Total	13,499	19,533	787,633	8,723	1.45	58

TABLE 5

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
ST. JOE OPERATION

State	Working	Acres Worked															
		By Forest Service					By Bureau of Entomology and Plant Quarantine					Total					
												Federal		Other			
		National Forest	Public Domain	State	Private	Total	National Forest	Public Domain	State	Private	Total	National Forest	Public Domain	State	Private	Total	Total
Idaho	First	193			69	262	22		5	32	59	215		5	101	106	321
	Second	997		37	120	1,154	1,125	10	353	480	1,968	2,122	10	390	600	990	3,122
	Third	2,784	123	557	469	3,933	1,725	201	1,358	2,839	6,123	4,509	324	1,915	3,308	5,223	10,056
	Total	3,974	123	594	658	5,349	2,872	211	1,716	3,351	8,150	6,846	334	2,310	4,009	6,319	13,499

TABLE 6

RIBES SPECIES ERADICATED, 1946
ST. JOE OPERATION

Working	Eradication Type	Acres	Ribes Species					Total Ribes
			Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes inerme	Ribes triste	
First	Reproduction (1910-39)	300	295,842	114,478				410,320
	Stream	21	8,249		6,620			14,869
	All Types	321	304,091	114,478	6,620			425,189
Second	Plantation (1940-44)	398	2,258	547				2,805
	Cutover (1920-39)	56	1,488	5,741	21			7,250
	Reproduction (1910-39)	2,411	49,653	22,699	182			72,534
	Pole	241	95	32	62	82		271
	Stream	16	280	94	2,460			2,834
	All Types	3,122	53,774	29,113	2,725	82		85,694
Third	Cutover (1920-39)	1,555	16,184	37,238	16			53,438
	Reproduction (1910-39)	5,690	55,603	66,881	282			122,766
	Pole	1,055	1,776	2,308	130	19		4,233
	Stream	1,756	14,404	29	81,580		300	96,313
	All Types	10,056	87,967	106,456	82,008	19	300	276,750
All Workings	Plantation (1940-44)	398	2,258	547				2,805
	Cutover (1920-39)	1,611	17,672	42,979	37			60,688
	Reproduction (1910-39)	8,401	401,098	204,058	464			605,620
	Pole	1,296	1,871	2,340	192	101		4,504
	Stream	1,793	22,933	123	90,660		300	114,016
	All Types	13,499	445,832	250,047	91,353	101	300	787,633

TABLE 7

SUMMARY OF RIBES ERADICATION, 1929-1946
ST. JOE OPERATION

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes	Net Acreage Remaining Worked	Net Acreage Remaining Unworked
First	Cutover	1945-49							1,838
	Cutover	1940-44	308	221	14,730	.72	48	308	34,933
	Plantation	1940-44	2,209	4,763	1,092,843	2.16	495	2,209	
	Cutover	1920-39	16,291	11,381	3,596,739	.70	221	16,291	156,962
	Reproduction	1910-39	217,901	241,186	81,166,676	1.11	372	217,901	104,772
	Pole		86,838	33,082	7,780,055	.38	90	86,750	18,516
	Mature		177,162	68,756	17,998,538	.39	102	120,397	85,906
	Miscellaneous		2,652	2,297	767,429	.87	289	2,652	
	Stream (1)		35,490	97,223	23,373,577	2.74	659	35,490	
	Total		538,851	459,909	135,790,587	.85	252	481,998	402,927
Second	Plantation	1940-44	1,143	1,063	56,187	.93	49	1,143	
	Cutover	1920-39	7,102	7,622	531,496	1.07	75	7,102	
	Reproduction	1910-39	80,911	97,098	9,148,630	1.20	113	80,911	
	Pole		37,089	21,748	1,318,279	.59	36	37,001	
	Mature		8,965	6,831	821,719	.76	92	8,055	
	Miscellaneous		431	43	2,567	.10	6	431	
	Stream (2)		12,654	27,585	5,194,326	2.18	410	12,654	
	Total		148,295	161,990	17,073,304	1.09	115	147,297	
Third	Plantation	1940-44	242	300	12,479	1.24	52	242	
	Cutover	1920-39	1,760	2,093	55,526	1.19	32	1,760	
	Reproduction	1910-39	27,204	46,660	999,653	1.72	37	27,204	
	Pole		5,680	3,302	78,325	.58	14	5,680	
	Mature		170	325	38,042	1.91	224	170	
	Stream (3)		9,460	16,000	1,802,236	1.69	191	9,460	
	Total		44,516	68,680	2,936,261	1.54	67	44,516	
All Workings	Cutover	1940-44	308	221	14,730	.72	48	308	
	Plantation	1940-44	3,594	6,126	1,161,509	1.70	323	3,594	
	Cutover	1920-39	25,153	21,096	4,133,761	.84	166	25,153	
	Reproduction	1910-39	326,016	384,944	91,314,959	1.18	280	326,016	
	Pole		129,607	58,132	9,176,759	.45	71	129,431	
	Mature		186,297	75,912	18,858,299	.41	101	128,622	
	Miscellaneous		3,083	2,340	769,996	.76	250	3,083	
	Stream (4)		57,604	140,808	30,370,139	2.44	527	57,604	
	Total		731,662	689,579	155,850,152	.94	213	673,811	

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	7,420	21,733	670,368
(2)	3,261	4,761	111,909
(3)	2,799	3,206	28,162
(4)	13,480	29,700	810,439

TABLE 8

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1929-1946
ST. JOE OPERATION

State	Class	Gross Acres	Man-Days	Total Ribes	Gallons Spray	Per Acre Man-Days	Per Acre Ribes
Idaho	EQ-Coop.	45,694	41,706	4,911,360	64,944	.91	107
	EQ-Emerg.	234,519	157,898	43,593,387	77,088	.67	186
	FS-Reg.	188,226	219,492	35,121,996	318,225	1.17	187
	FS-Emerg.	70,981	45,138	15,333,106	101,476	.64	216
	CCC	192,242	225,345	56,890,303	248,706	1.17	296
	Total	731,662	689,579	155,850,152	810,439	.94	213

TABLE 9

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1929-1946
ST. JOE OPERATION

State	Ownership	Net Acres in Control Area: Acres Worked First	Acres Worked Second	Acres Worked Third	Acres Worked Total	Acres Unworked	Total Acres
Idaho	National Forest	215,199	79,101	24,470	318,770	97,009	312,208
	Public Domain	12,458	5,169	1,678	19,305	12,007	24,465
	Subtotal Federal	227,657	84,270	26,148	338,075	109,016	336,673
	State	57,903	19,603	5,468	82,974	57,166	115,069
	Private	196,438	43,424	12,900	252,762	236,745	433,183
	Subtotal Other	254,341	63,027	18,368	335,736	293,911	548,252
	Total	481,998	147,297	44,516	673,811	402,927	884,925

BLISTER RUST CONTROL WORK, COEUR D'ALENE OPERATION, 1946

By
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INTRODUCTION

Heavy snows that were late in withdrawing prevented an early start on the 1946 ribes eradication program. The road was not cleared into Jordan Creek, the site of the first camp, until May 20. On June 4, ribes eradication was started here and at the Lone Cabin Camp. The last camp was closed on September 13.

Seven camp sites were occupied, three of which (Jordan, Lone Cabin and Hudlow) were built to accommodate 60 men each. In addition, six men were used for a short time on the Steamboat Timber Sale area. A total of 335 was employed at the peak of the season. All work was performed on lands held in Federal ownership and was financed by regular Forest Service appropriations.

As in the past few years, the principal source of labor was the teen-age class of boys. As a group, they are mostly untrained to work at all, which, coupled with a shortage of competent supervisory personnel, creates an unfavorable labor situation. With this type of labor, it is difficult to meet the eradication standards without considerable rework, hence production is seriously curtailed.

Fire fighting again called heavily on the personnel assigned to the blister rust project. Practically no blister rust work was accomplished during the month of August due to these interruptions. It is estimated that five weeks represented the average effective time obtained from each worker on blister rust control. This short season cannot be avoided when blister rust employees are the only sizeable crews available for fire fighting and teen-age boys comprise the labor force.

The Forest Service was responsible for the administration and operation of the camps, and technical supervision was provided by the Bureau of Entomology and Plant Quarantine.

LOCATION AND DESCRIPTION OF AREAS

1. Jordan Camp, working unit Nos. 31 and 32. This area is located in secs. 4, 7, 8, 9 and 17 of T. 53 N., R. 3 E. Most of the work was performed on natural reproduction areas which border on plantations of 1924 origin. Working conditions were generally very difficult, both on initial and rework areas. Some maintenance work was performed on the plantations proper and this phase of control work will be extended next year. Ribes eradication was commenced June 4 and discontinued on September 12, at which time there were only six field men remaining. Pine infection on this area is quite spotted but generally light.

2. Lone Cabin Camp, working unit No. 1. The work area is located in secs. 18, 19 and 20 of T. 51 N., R. 1 W., and secs. 13, 22, 24 and 25 of T. 51 N., R. 2 W. This crew commenced ribes eradication June 4 and the camp was closed August 30. All control efforts represented rework on lands cut over in 1929 from which the seed trees were removed in 1941-1942, and 20 acres of pole on which rework was not completed in 1945. Small suppressed Ribes lacustre are intermingled with brush on the cutover areas, and it is thought that these troublesome bushes are to some degree responsible for the build-up of pine infection present. This probability was made the subject of an investigative study conducted in connection with ribes eradication on the Deception Creek Experimental Forest. The intensity of the disease is best indicated by the results of the pruning work which was an extension of that reported in 1945 on Lone Cabin drainage. A total of 219 man-days were expended treating 113,022 trees. Of this number, 21,131, or 18.7 per cent, were removed because of killing cankers already present on the trunk. Thousands of trees were saved by the pruning.

3. Nowhere Camp, working unit Nos. 25 and 38. Work was performed in secs. 4, 5, 6, 7 and 8 of T. 51 N., R. 3 E., secs. 13, 14, 23 and 24 of T. 52 N., R. 2 E. and secs. 17, 19, 29, 32 and 33 of T. 52 N., R. 3 E. This camp was started on ribes eradication June 10 and was closed September 3. Maintenance work was performed on two areas near Bennett and Cardinal Creeks on which the residual hemlock was girdled following logging in 1918-1922. About 50 per cent of the Flat Creek burn, which was planted in 1941, was given a second working, the remainder having reached a maintenance status as a result of one working. Rework on the Nowhere plantation was completed and the area worked also represents an extension of the protection afforded to the more recent Brett Creek plantation. The stream type and flat at the mouth of President Creek were given a mop-up. About five acres of R. viscosissimum were removed from Chicago Point. These bushes were capable of casting sporidia on reproduction stands below. Infection on these areas, judging from observations, will vary from 5 to 20 per cent.

4. Hudlow Camp, working unit Nos. 2, 3, 4 and 5. Areas worked were located in secs. 23 and 24 of T. 52 N., R. 2 W., and secs. 5, 7, 8, 9, 17, 18, 19, 20, 21, 28, 30 and 31 of T. 52 N., R. 1 W. This camp commenced work June 11 and was closed September 13. All of the areas worked have been logged since 1933, followed by some form of rehabilitation, such as hemlock removal or broadcast burning. Frog Creek, Tom Lavin, Lewelling and the Middle and East Forks of Hudlow were all reworked. Because of the small bush problem, most of these stands will have to be worked again. First working was initiated on the Iron Creek cutover area lying between Rabbens Fork and Moose Creek, and rework of the Solitaire Creek plantation area was started. Disease is well established in these areas following its first big build-up in 1937. Hudlow Camp will be occupied again next year and ribes eradication on these young pine areas extended.

5. Deception Creek Camp, working unit No. 10. Work was started at this camp on June 18 and ceased on August 22. Areas were located in secs. 28, 29, 30, 31 and 32 of T. 51 N., R. 1 W. All work was on areas which have been subjected to some kind of treatment by the Northern Rocky Mountain Experiment Station on Sands Creek, Ames Creek, Deception Creek and Finger Gulch. The

Ames Creek work was supervised by Richard T. Bingham, who recorded data designed to determine the disease-spreading potentialities of suppressed R. lacustre. His figures show about 8 per cent infection with practically all of it damaging. The full text of this report is to be found in the Ecology section of the Northwestern Region annual report.

6. Independence Camp, working unit No. 27. This camp performed rework in the head of Owl Creek in secs. 1 and 2 of T. 52 N., R. 1 E. This camp was established June 25 and closed August 27. Part of this area has been planted and the remainder has natural reproduction. Due to the short time the camp was in operation, and interruptions caused by fire calls, very little was accomplished. Pine infection is probably less than five per cent for this area.

7. Trail Creek Camp, working unit No. 21. This camp started ribes eradication July 2 and was closed August 19. Rework was performed on areas in secs. 22 and 23 of T. 52 N., R. 1 E. This area has very good natural reproduction which was established following the 1910 burn. Working conditions are quite difficult. Little control work was accomplished as this camp had a very short season. Pine infection is quite heavy but due to the advanced age class, not very damaging.

8. Steamboat Creek, working unit No. 43. Work was performed in secs. 26, 27, 34 and 35 of T. 51 N., R. 2 E., during August by a six man fire suppression crew. This area was clear-cut except for seed trees and unmerchantable saw timber, in 1943 and 1944. The canopy was opened sufficiently to permit both pine and ribes germination on much of the area. The purpose of this work was to remove the infected ribes by a fast working to prevent heavy pine infection from becoming established. There were 4,595 ribes eradicated from 175 acres at an expenditure of 119 man-days, or at a rate of 26 ribes and .68 man-days per acre. No particular effort was made to get all of the ribes seedlings since the end of the germination period has not yet been reached.

WORKING METHODS

The general practice was to organize a camp into three-man crews, and then, depending upon available supervision, work them in adjacent strips or assign each crew a small block of its own. Men capable of acting in a foreman capacity were at a premium, but whenever possible, three or four crews were placed under the direct supervision of a straw boss. All methods of crew organization were given trial and that plan adopted which seemed to give the best results for that particular area.

In all camps, initial training on ribes eradication was given by a member of the permanent staff. Thereafter, late-comers or replacements were trained by the camp boss. One perplexing problem has been presenting itself recently in some areas: Ribes have been reduced to the point where it is difficult to find satisfactory training areas reasonably near to camp establishment. To enable crewmen to develop the knack of spotting ribes, they should be trained on areas supporting fifty or more bushes per acre. Many large areas have had the ribes reduced far below this point.

CHECKING AND SURVEYS

Sixteen checkers were used at one time or another during the season, five of whom were experienced from the previous year. Besides checking the current season's work, these men were used on three types of special surveys.

A seven-man crew working from Beaver Station ran 61 miles of strip on which stocking data, ribes count and disease information were recorded. Also, the limits of high fire hazard areas were determined. From these data, it was decided to defer work on the area until the entire unit has been rehabilitated. The results of the infection study are tabulated under disease survey.

An aggressive post checking program covered the following areas to be worked in the near future.

	Miles of Strip
Flat Creek	7.3
Big Elk Creek	2.8
Little Elk Creek	5.9
Short Creek	7.5
Riley Creek Area	11.0
Upper Tepee Creek	30.3
Fern Creek	15.6
Squeak Creek	11.9
Independence Creek	36.8
Jordan Plantation	96.2
Total	225.3

Disease survey activities were postponed until late fall after it was necessary to discontinue post checking. Due to the reduced number of personnel, only special areas were inspected, other than the large area near Beaver Station. The results of this survey are tabulated below:

Area	Miles Strip	Trees Examined	Trees Infected	Per cent Trees Infected
Beaver Station, secs. 13, 22, 23, 24, 26, 27, T. 54 N., R. 1 E.; secs. 18, 19, 20, 29, 30, 32, T. 54 N., R. 2 E.	61.0	3,171	194	6.1
West Elk Creek, secs. 14, 15, 22, 23, 24, 25, 30, T. 53 N., R. 2 E.	13.7	5,344	149	2.8
Trail Creek, secs. 23, 26, T. 52 N., R. 1 E.	1.9	658	56	8.5
East Fork Plantation, secs. 29, 30, 31, 32, T. 53 N., R. 2 E.	6.2	1,754	99	5.6

West Elk was given first working in 1936 and a second working on part of it is contemplated for next year. Most of the Trail Creek area has received one working but the unworked portion runs heavy to ribes. The East Fork Plantation is unworked, though it is in the work plans for 1947. The rust build-up is not considered high for any of these areas.

Area classification for the operation was virtually completed in 1946. Exceptions are areas in the Magee District, an area near the mouth of the North Fork, Coeur d'Alene River, a few isolated areas of a section or less and refinement of some of the earlier classifications. With the information now available, it will be possible to quite carefully delimit all existing white pine growing areas and make recommendations for rehabilitating those capable of growing white pine. A disturbing situation was noted during the progress of the area classification, and that is the spread of a disease, as yet unidentified, that is ravaging some of the better white pine pole stands on the forest. It was first noted in the Cedar Creek Canyon alongside of Highway No. 10 but has since become evident almost everywhere this age class of timber exists. The original center has already passed from a class I area to a class II, and may soon cease to be a white pine type altogether. The situation is more alarming when it is realized that the disease seems to attack that age class which is in such short supply. Definite survey and control action is needed; the situation is serious.

CONTROL STATUS

Until the area classification summary is completed and the status of areas thus surveyed is determined, any figure listed showing status of control would be very much of an estimate. Approximately 40,000 acres are in need of a post check at the present time. A concerted effort will be made to bring this program up to date in the next two years. Because of the quality of labor, the age class of the stands and the number of ribes removed, very little of the area worked in 1946 can be placed on a maintenance basis.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures is shown in the following tables by the cooperative agency and the type of appropriation.

TABLE 1
EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
COEUR D'ALENE OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 6,380.20
Forest Service	Regular BLR-4	174,417.11
Total		$180,797.31

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
COEUR D'ALENE OPERATION

Item	Bureau of Entomology and Plant Quarantine Regular BLR-1-4	Forest Service Regular BLR-4	Total
Sal. perm. men	$6,163.94	$ 5,968.70	$ 12,132.64
Sal. temp. men		24,690.15	24,690.15
Wages, temp. labs.		105,131.89	105,131.89
Subs. supplies		28,033.57	28,033.57
Equipment		4,833.03	4,833.03
Travel and Transp.	213.76	2,380.49	2,594.25
Other supplies	2.50	3,379.28	3,381.78
Total	$6,380.20	$174,417.11	$180,797.31

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
COEUR D'ALENE OPERATION

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre	
						Man-Days	Ribes
First	Cutover	1940-44	175	119	5,065	.68	29
	Cutover	1920-39	189	485	67,742	2.57	358
	Reproduction	1910-39	101	290	17,406	2.87	172
	Pole		27	25	2,683	.93	99
	Stream		7	66	6,189	9.43	884
	Total		499	985	99,085	1.97	199
Second	Cutover	1920-39	451	600	44,764	1.33	99
	Reproduction	1910-39	1,111	2,039	95,579	1.84	86
	Pole		25	43	1,737	1.72	69
	Mature		64	46	2,695	.72	42
	Stream		16	94	7,851	5.88	491
	Total		1,667	2,822	152,626	1.69	92
Third	Cutover	1920-39	1,079	1,910	105,131	1.77	97
	Reproduction	1910-39	970	1,324	38,286	1.36	39
	Pole		77	117	11,939	1.52	155
	Mature		140	137	6,771	.98	48
	Miscellaneous		48	61	2,145	1.27	45
	Stream		172	201	10,035	1.17	58
	Total		2,486	3,750	174,307	1.51	70
All Workings	Cutover	1940-44	175	119	5,065	.68	29
	Cutover	1920-39	1,719	2,995	217,637	1.74	127
	Reproduction	1910-39	2,182	3,653	151,271	1.67	69
	Pole		129	185	16,359	1.43	127
	Mature		204	183	9,466	.90	46
	Miscellaneous		48	61	2,145	1.27	45
	Stream		195	361	24,075	1.85	123
	Total		4,652	7,557	426,018	1.62	92

TABLE 4

RIBES SPECIES ERADICATED, 1946
COEUR D'ALENE OPERATION

Working	Eradication Type	Acres	Ribes Species			Total Ribes
			Ribes lacustre	Ribes viscosissimum	Ribes inerme	
First	Cutover (1940-44)	175	247	4,818		5,065
	Cutover (1920-39)	189	67,123	619		67,742
	Reproduction (1910-39)	101	17,197	209		17,406
	Pole	27	2,665	18		2,683
	Stream	7	6,189			6,189
	All Types	499	93,421	5,664		99,085
Second	Cutover (1920-39)	451	40,921	3,843		44,764
	Reproduction (1910-39)	1,111	92,287	3,281	11	95,579
	Pole	25	1,191	546		1,737
	Mature	64	2,695			2,695
	Stream	16	7,851			7,851
	All Types	1,667	144,945	7,670	11	152,626
Third	Cutover (1920-39)	1,079	92,907	12,224		105,131
	Reproduction (1910-39)	970	29,196	9,090		38,286
	Pole	77	11,100	839		11,939
	Mature	140	6,771			6,771
	Miscellaneous	48	1,436	709		2,145
	Stream	172	8,981		1,054	10,035
	All Types	2,486	150,391	22,862	1,054	174,307
All Workings	Cutover (1940-44)	175	247	4,818		5,065
	Cutover (1920-39)	1,719	200,951	16,686		217,637
	Reproduction (1910-39)	2,182	138,680	12,590	11	151,271
	Pole	129	14,956	1,403		16,359
	Mature	204	9,466			9,466
	Miscellaneous	48	1,436	709		2,145
	Stream	195	23,021		1,054	24,075
	All Types	4,652	388,757	36,196	1,065	426,018

TABLE 5

SUMMARY OF RIBES ERADICATION, 1927 - 1946
COEUR D'ALENE OPERATION

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre		Net Acreage Remaining	
						Man-Days	Ribes	Worked	Unworked
First	Plantation	1945-49	715	403	9,547	.56	13	715	
	Cutover	1940-44	175	119	5,065	.68	29	175	10,593
	Burn	1940-44	716	351	53,652	.49	75	716	246
	Plantation	1940-44	992	1,920	465,201	1.94	469	992	227
	Cutover	1920-39	16,420	21,569	5,382,455	1.31	328	16,420	19,189
	Reproduction	1910-39	89,797	139,402	20,717,549	1.55	231	87,974	10,712
	Pole		65,893	31,279	4,482,605	.47	68	65,157	9,538
	Mature		141,096	87,729	13,798,358	.62	98	123,079	7,390
	Miscellaneous		13,333	16,695	2,965,945	1.25	222	12,909	304
	Stream		14,875	57,772	11,822,133	3.88	795	14,767	2,648
	Total		344,012	357,239	59,702,510	1.04	174	322,904	60,847
Second	Plantation	1940-44	618	1,529	130,960	2.47	212	618	
	Cutover	1920-39	9,389	13,368	1,969,695	1.42	210	9,389	
	Reproduction	1910-39	18,398	30,943	1,920,415	1.68	104	17,665	
	Pole		4,841	3,136	487,525	.65	101	4,841	
	Mature		10,182	8,117	813,461	.80	80	9,882	
	Miscellaneous		1,585	2,963	358,052	1.87	226	1,585	
	Stream		7,803	14,287	1,568,802	1.83	201	7,695	
	Total		52,816	74,343	7,248,910	1.41	137	51,675	
Third	Plantation	1940-44	513	919	51,175	1.79	100	513	
	Cutover	1920-39	4,325	7,974	398,718	1.84	92	4,325	
	Reproduction	1910-39	4,493	7,216	270,275	1.61	60	3,886	
	Pole		826	796	64,083	.96	78	826	
	Mature		1,853	1,373	77,381	.74	42	1,853	
	Miscellaneous		61	72	3,569	1.18	59	61	
	Stream		1,637	2,815	142,016	1.72	87	1,637	
	Total		13,708	21,165	1,007,217	1.54	73	13,101	
All Workings	Plantation	1945-49	715	403	9,547	.56	13	715	
	Cutover	1940-44	175	119	5,065	.68	29	175	
	Burn	1940-44	716	351	53,652	.49	75	716	
	Plantation	1940-44	2,123	4,368	647,336	2.06	305	2,123	
	Cutover	1920-39	30,134	42,911	7,750,868	1.42	257	30,134	
	Reproduction	1910-39	112,688	177,561	22,908,239	1.58	203	109,525	
	Pole		71,560	35,211	5,034,213	.49	70	70,824	
	Mature		153,131	97,219	14,689,200	.63	96	134,814	
	Miscellaneous		14,979	19,730	3,327,566	1.32	222	14,555	
	Stream		24,315	74,874	13,532,951	3.08	557	24,099	
	Total		410,536	452,747	67,958,637	1.10	166	387,680	

TABLE 6

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1927 - 1946
COEUR D'ALENE OPERATION

State	Class	Acres	Man-Days	Ribes	Per Acre	
					Man-Days	Ribes
Idaho	EQ-Reg.	25,776	8,351	2,846,383	.32	110
	EQ-Emerg.	41,039	35,541	6,589,217	.86	161
	FS-Reg.	83,739	101,956	14,757,405	1.22	176
	FS-Emerg.	111,711	86,897	17,620,173	.78	158
	CCC	148,271	220,002	26,145,459	1.48	176
	Total	410,536	452,747	67,958,637	1.10	166

TABLE 7

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1927 - 1946
COEUR D'ALENE OPERATION

State	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Idaho	National Forest	306,760	49,431	12,972	369,163	53,896	360,656
	State	5,427	440	45	5,912	711	6,138
	Private	10,717	1,804	84	12,605	6,240	16,957
	Subtotal Other	16,144	2,244	129	18,517	6,951	23,095
	Total	322,904	51,675	13,101	387,680	60,847	383,751

BLISTER RUST CONTROL WORK, KANIKSU OPERATION, 1946

By
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INTRODUCTION

The Blister Rust control program on the Kaniksu National Forest during the 1946 field season consisted of six camps administered by the Bureau of Entomology and Plant Quarantine and six camps administered by the Forest Service. The bulk of the work was performed on areas of high priority pole, reproduction stands and recent cutover areas in Bonner and Boundary Counties in Idaho and Pend Oreille County in Washington.

The season was again characterized by a dearth of older and experienced workers. This resulted in the recruitment of teen-age boys from local high schools. Some boys were not available until after June 1; some had to return to school by August 25, thus making a short field season. The project was somewhat more fortunate than for the past several years in that more experienced foremen and camp superintendents were available. Turnover in personnel still seems to be a major difficulty in keeping the camps filled. In order to minimize this turnover which in many cases is caused by homesickness, recreation trips, athletic facilities and inter-camp athletic competition were promoted as much as possible. In addition to the short season, accomplishments were materially reduced by crews being called out for fire suppression. A total of 714 man-days by the Bureau of Entomology and Plant Quarantine and 2,392 man-days by the Forest Service blister rust crews were spent on fire suppression work. The interruption caused by the fires came in August when the camps were operating at peak efficiency which was never again reached after the crews returned.

The first ribes eradication was done at Bureau Camp 401 on Pack River near Sandpoint, Idaho, on May 20. Good weather conditions prevailed throughout the season for most of the camps except for two Bureau camps in the vicinity of the upper Priest River drainage which lost approximately six work days each during the month of June. Due to the inability to secure workers one Bureau and two Forest Service camps were not manned until the last week in June. The Forest Service secured 140 Mexican Nationals through the War Food Administration during July which were used on regular eradication work. These workers stayed until September 26. All other Forest Service camps were closed during the last week in August. During the season a total of 16,279 acres were worked by Bureau camps, of which 1,890 acres were initial and 14,389 acres second and third workings. The Forest Service worked a total of 7,721 acres, of which 1,842 acres were initial and 5,879 acres second and third workings. The following accomplishments were made by the different classes of labor.

Ribes Eradication

Labor	Number Workers	Acres	Man-days	Ribes
E. Q. Student	275	16,279	8,241	373,377
F. S. Student	120	6,109	5,411	876,849
F. S. Mexican Labor	142	1,612	2,603	426,495
Total	537	24,000	16,255	1,676,721

ORGANIZATION AND ADMINISTRATION

Blister Rust control work on the Kaniksu operation was administered in accordance with the cooperative working agreement between the Bureau of Entomology and Plant Quarantine and the Forest Service. Full responsibility for the administration of the regular Forest Service camps came within the jurisdiction of the Forest Service personnel. Technical advice and training assistance were afforded by the Bureau of Entomology and Plant Quarantine personnel. All phases of the work on State, private and intermingled Federal lands were administered by Bureau of Entomology and Plant Quarantine personnel. Mr. Kermit Miller, who was on the project during 1940 and 1941, was appointed Blister Rust Staff Man by the Forest Service and assigned to the Kaniksu Project.

Blister Rust Headquarters on Kalispell Bay served as the operation headquarters for both Forest Service and Bureau camps. The clerical work necessary for the ordering and handling of supplies and equipment, preparation of pay rolls, property records, etc., was handled respectively by Forest Service and Bureau clerks and warehousemen. Supplies and equipment were delivered from Spokane by motor freight. Deliveries were made to the individual camps at least once a week by delivery trucks operating out of headquarters. Two Bureau camps located in the vicinity of Upper Priest Lake were serviced by boat and pack stock. Packing service was secured through cooperation from the Forest Service. The organization on the project was as follows:

Bureau of Entomology and Plant Quarantine	U. S. Forest Service
H. A. Brischle, Operation Supervisor	Kermit Miller, Forest Officer
J. C. Gynn, Assistant Operation Supervisor	M. C. Aaberg, Unit Supervisor
L. J. Easley, Unit Supervisor	N. C. Perring, Unit Supervisor
G. M. Houghton, Checking Supervisor	

Program	Number of Camps	Number Workers	Number Checkers
FS-Regular	3	120	3
FS-Regular Mexican	3	142	3
EQ-Cooperative	6	275	6
		537	

CHECKING AND PINE DISEASE SURVEY

The checking organization was composed of six checkers from the Forest Service and five from the Bureau. In addition the Bureau had one senior checker and two checker foremen. The latter two supervised the checking work in both the Forest and Bureau camps. All of the checkers employed had at least two years of previous experience in blister rust control work. Eight of the checkers were experienced. The others were chosen for this work for their ability to find ribes.

All but 300 of the 24,000 acres worked were checked. The unchecked area in Lamb Creek has been deferred until the spring of 1947. In addition to the check on the current season's work, 5,000 acres of post check was completed, and classified, 1,500 acres of maintenance and 3,500 acres of rework.

Some areas were checked by a checker flanker method. This method consisted of the checker running his regular 16 foot strip aided by one flanker who ran a meandering course adjacent to the checker. All of the ribes found were recorded as on regular check. Ten per cent of the area was covered when this method was employed and it afforded a good means of locating scattered ribes.

After the completion of the regular season's work, a party of six men conducted an advance check on some areas to be worked next year. Training areas for the eradication crews were located, and the extent of the control work was determined. This party also conducted a pine disease survey on the 1926 burn areas of the Tillicum Creek, South Fork of Granite Creek and Cache Creek drainages. A survey was made on two plantations. They were the 1940 Kalispell Creek and the 1937 Quartz Creek plantations. The heavy spread of rust in 1941 is evidenced in the 1926 burn areas. The two plantations are growing nicely and the spread of the rust in them has been well controlled. The results of these surveys are tabulated below:

Kalispell Creek Drainage (Virgin Creek)

Number of trees examined	1,066
Number of trees infected	38
Per cent of trees infected	3.6
Per cent of trees with killing cankers*	3.5

Quartz Creek Plantation

Number of trees examined	1,312
Number of trees infected	165
Per cent of trees infected	12
Per cent of trees with killing cankers*	10

*Cankers on the trunks of the trees and cankers on the limbs that may spread from the limbs into the trunks.

Tillicum Creek

Number of trees examined	2,777
Number of trees infected	819
Per cent of trees infected	30
Per cent of trees with killing cankers*	29

Cache Creek

Number of trees examined	661
Number of trees infected	294
Per cent of trees infected	44
Per cent of trees with killing cankers*	35

South Fork of Granite Creek

Number of trees examined	855
Number of trees infected	379
Per cent of trees infected	44
Per cent of trees with killing cankers*	36

DESCRIPTION AND LOCATION OF WORK AREAS

Camp 401 T. 60 N., R. 2 W., sec. 21
Located at mouth of Jeru Creek on Pack River. All work was in white pine reproduction and pole stands with the exception of a small amount of protection zone expansion in cutover and mature bordering the area. This area is an old double burn and previous workings had left light scattered ribes distributed over most of the area thus making it possible to use the checker flanker method. After final check, 2,539 acres were placed on maintenance, 220 acres on post check and 240 acres on rework.

Camp 402 T. 57 N., R. 3 W., sec. 1
Located on Fox Creek. Work area was in old cutover and single burn areas supporting good reproduction and pole stands of white pine. Ground cover was very dense with Ribes viscosissimum and R. lacustre generally scattered over the area. Many small upland streams bordered with brush and alder thickets were encountered making ribes eradication difficult. Checking results show most of the area will be placed on post check for further inspection.

Camp 403 T. 63 N., R. 4 W., sec. 17
Located on lower Trapper Creek one mile above Upper Priest Lake. Area in old double burn now supporting excellent stand of white pine pole. Area was worked previously in 1932. The checker flanker method was used on much of the area. After final check, 3,729 acres were placed on maintenance and 320 acres on post check.

*Cankers on the trunks of the trees and cankers on the limbs that may spread from the limbs into the trunks.

Camp 404 T. 63 N., R. 4 W., sec. 5
Located five miles above Upper Priest Lake on Trapper Creek. Camp area was a continuation of the Camp 403 area. This area also supports an excellent stand of white pine pole in an old double burn. A small amount of mature was worked bordering the area as a protection zone to the pole. Final checking results placed 1,839 acres on maintenance, 660 acres on post check and 320 acres on rework.

Camp 405 T. 60 N., R. 2 W., sec. 29
Located two and one-half miles above Camp 401 on Upper Jeru Creek. Area worked was old single burn supporting good white pine reproduction. Heavy concentrations of R. lacustre existed on the area which was covered with many windfalls and brush, making ribes eradication extremely difficult. This area was worked to protect not only the reproduction present but also a fine stand of white pine pole immediately below the ribes concentrations.

Camp 406 T. 59 N., R. 2 W., sec. 14
Located one-half mile above Pack River on Caribou Creek. The area worked was white pine pole and reproduction stands on the valley floor along lower Pack River. Previous workings had left light scattered ribes over the area making it possible for the checker flanker method to be used on the upland types with crew work being concentrated on the large amount of stream type existing in this area. After the final check had been made, 2,307 acres were placed on maintenance, 200 acres on post check and 180 acres on rework.

Camp 451 T. 33 N., R. 45 E. W. M., sec. 13
Located in the Boswell area on the Lower West Branch of Priest River. Worked area consisted of two burns, one of 60 acres of 1938 origin from which 490 ribes per acre were removed. The second area of 225 acres was first burned in 1938, snagged during the winter of 1944 and 1945, then control burned in September of 1945. These areas are both excellent white pine sites and are to be planted to white pine in the near future. Checking results indicate that a few seedlings are still coming in, therefore, both areas were placed on rework.

Camp 452 T. 35 N., R. 45 E. W. M., sec. 13
Located in Squaw Valley on the Upper West Branch of Priest River. The area consisted of cutover 1920-1939, reproduction and pole types. Previous workings indicated that the area was approaching a maintenance standard, hence the checker flanker method was used over most of the area. After final check was made, 1,500 acres were placed on maintenance, 1,506 acres on post check and 800 acres on rework.

Camp 453 T. 35 N., R. 45 E. W. M., sec. 2
Located on Lamb Creek. The area consisted of a plantation and protection zone strip. First work, consisting of 309 acres of heavy ribes concentration, was completed around the edge of the Lamb Creek plantation; 787 acres of second and third work was done within the plantation. After the final check was completed, 160 acres were placed on post check, 636 acres on rework and the balance will not be checked until the spring of 1947.

Camp 454 T. 36 N., R. 45 E. W. M., sec. 29
Located on Kalispell Creek. About one half of this area was worked as a protection zone to afford additional protection to the adjacent Kalispell Creek plantation. First work consisting of 210 acres and 246 acres of second work were done. All first work was in extremely heavy ribes and brush. First working removed 1,503 ribes per acre and 129 ribes per acre were removed on second working. After final check, 80 acres were placed on maintenance and 376 acres on rework.

Camp 455 T. 28 N., R. 4 W., sec. 27
Located on Diamond Creek. The area consisted of reproduction and pole stands. Heavy R. lacustre in reproduction along the streams constituted the major problem. A total of 1,086 acres were worked. After final check, 636 acres were placed on maintenance and 450 acres on rework. Of this rework area, 200 acres are in major stream type along Diamond Creek.

Camp 456 T. 36 N., R. 46 E. W. M., sec. 7
Located at the Experimental Station. Work area consisted of an experimental cutting strip five chains wide and one mile long. The cutting was made in 1938 and 1939. The area was first worked in 1942 at which time a few large ribes were removed and a very heavy crop of seedlings noted. During the 1946 working, 3,621 ribes per acre were removed. This camp also worked the stream type acreage in the Experimental Station area. The checking results show but a few ribes seedlings remaining in the cutting strip.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs is shown in the following table by cooperative agency and the type of appropriation:

TABLE 1

EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
KANIKSU OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 28,050.06
	Regular BLR-3-4	136,929.97
	Subtotal	$164,980.03
State of Idaho Priest Lake Timber Protective Association	State BLR-3-4	$ 7,264.47
	Private BLR-3-4	6,965.38
	Subtotal	$ 14,229.85
Forest Service	Regular BLR-4	$188,268.81
Total		$367,478.69

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Total		$367,478.69

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
KANIKSU OPERATION

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre	
						Man-Days	Ribes
First	Burn	1945-49	243	548	111,750	2.26	460
	Cutover	1940-44	223	193	185,767	.87	833
	Cutover	1920-39	728	939	84,123	1.29	116
	Reproduction	1910-39	773	2,385	445,029	3.09	577
	Pole		708	231	7,900	.33	10
	Mature		513	309	16,028	.60	31
	Miscellaneous		343	690	294,813	2.01	860
	Stream		201	317	21,371	1.58	106
	Total		3,732	5,612	1,166,781	1.50	313
Second	Plantation	1940-44	28	46	4,332	1.64	155
	Cutover	1920-39	90	611	24,695	6.79	274
	Reproduction	1910-39	3,698	2,432	122,112	.66	33
	Pole		9,056	2,898	118,991	.32	13
	Mature		282	258	8,083	.91	29
	Miscellaneous		248	123	2,329	.50	9
	Stream		2,103	1,665	69,857	.79	33
	Total		15,505	8,033	350,399	.52	23
Third	Plantation	1940-44	211	35	1,258	.17	6
	Cutover	1920-39	1,651	754	37,074	.46	22
	Reproduction	1910-39	1,528	1,290	35,573	.84	23
	Pole		495	147	29,974	.30	61
	Mature		436	212	48,006	.49	110
	Miscellaneous		368	67	1,237	.18	3
	Stream		74	105	6,419	1.42	87
	Total		4,763	2,610	159,541	.55	33
All Workings	Burn	1945-49	243	548	111,750	2.26	460
	Cutover	1940-44	223	193	185,767	.87	833
	Plantation	1940-44	239	81	5,590	.34	23
	Cutover	1920-39	2,469	2,304	145,892	.93	59
	Reproduction	1910-39	5,999	6,107	603,714	1.02	101
	Pole		10,259	3,276	155,865	.32	15
	Mature		1,231	779	72,117	.63	59
	Miscellaneous		959	880	298,379	.92	311
	Stream		2,378	2,087	97,647	.88	41
	Total		24,000	16,255	1,676,721	.68	70

TABLE 4

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1946
KANIKSU OPERATION

State	Working	Class	Acres	Man-Days	Ribes	Per Acre	
						Man-Days	Ribes
Idaho	First	EQ-Coop.	1,890	1,369	96,419	.72	51
		FS-Reg.	361	403	181,219	1.12	502
		Total	2,251	1,772	277,638	.79	123
	Second	EQ-Coop.	10,413	5,047	144,843	.48	14
		FS-Reg.	1,700	1,090	77,920	.64	46
		Total	12,113	6,137	222,763	.51	18
	Third	EQ-Coop.	3,976	1,825	132,115	.46	33
	All Workings	EQ-Coop.	16,279	8,241	373,377	.51	23
		FS-Reg.	2,061	1,493	259,139	.72	126
		Total	18,340	9,734	632,516	.53	34
Washington	First	FS-Reg.	1,481	3,840	889,143	2.59	600
	Second	FS-Reg.	3,392	1,896	127,636	.56	38
	Third	FS-Reg.	787	785	27,426	1.00	35
	All Workings	FS-Reg.	5,660	6,521	1,044,205	1.15	184
Total	First	EQ-Coop.	1,890	1,369	96,419	.72	51
		FS-Reg.	1,842	4,243	1,070,362	2.30	581
		Total	3,732	5,612	1,166,781	1.50	313
	Second	EQ-Coop.	10,413	5,047	144,843	.48	14
		FS-Reg.	5,092	2,986	205,556	.59	40
		Total	15,505	8,033	350,399	.52	23
	Third	EQ-Coop.	3,976	1,825	132,115	.46	33
		FS-Reg.	787	785	27,426	1.00	35
		Total	4,763	2,610	159,541	.55	33
	All Workings	EQ-Coop.	16,279	8,241	373,377	.51	23
		FS-Reg.	7,721	8,014	1,303,344	1.04	169
		Total	24,000	16,255	1,676,721	.68	70

TABLE 5

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
KANIKSU OPERATION

State	Working	Acres Worked											
		By Forest Service			By Bureau of Entomology and Plant Quarantine				Total				
									Federal	Other			
		National Forest	Private	Total	State	Private	Forest Service	Total	National Forest	State	Private	Total	Total
Idaho	First	361		361	1,482	408		1,890	361	1,482	408	1,890	2,251
	Second	1,380	320	1,700	5,342	3,722	1,349	10,413	2,729	5,342	4,042	9,384	12,113
	Third				2,096	920	960	3,976	960	2,096	920	3,016	3,976
	Total	1,741	320	2,061	8,920	5,050	2,309	16,279	4,050	8,920	5,370	14,290	18,340
Washington	First	1,312	169	1,481					1,312		169	169	1,481
	Second	3,257	135	3,392					3,257		135	135	3,392
	Third	787		787					787				787
	Total	5,356	304	5,660					5,356		304	304	5,660
Total	First	1,673	169	1,842	1,482	408		1,890	1,673	1,482	577	2,059	3,732
	Second	4,637	455	5,092	5,342	3,722	1,349	10,413	5,986	5,342	4,177	9,519	15,505
	Third	787		787	2,096	920	960	3,976	1,747	2,096	920	3,016	4,763
	Total	7,097	624	7,721	8,920	5,050	2,309	16,279	9,406	8,920	5,674	14,594	24,000

TABLE 6

RIBES SPECIES ERADICATED, 1946
KANIKSU OPERATION

Working	Eradication Type	Acres	Ribes Species			Total Ribes
			Ribes lacustre	Ribes viscosissimum	Ribes inerme	
First	Burn (1945-49)	243	11,990	99,760		111,750
	Cutover (1940-44)	223	28,656	157,111		185,767
	Cutover (1920-39)	728	83,702	421		84,123
	Reproduction (1910-39)	773	39,957	406,072		446,029
	Pole	708	5,439	1,461		6,900
	Mature	513	15,087	941		16,028
	Miscellaneous	343	16,266	278,417	130	294,813
	Stream	201	20,922	218	231	21,371
	All Types	3,732	222,019	944,401	361	1,166,781
Second	Plantation (1940-44)	28	253	4,079		4,332
	Cutover (1920-39)	90	11,981	12,714		24,695
	Reproduction (1910-39)	3,698	52,087	46,713	23,312	122,112
	Pole	9,056	76,121	40,783	2,087	118,991
	Mature	282	7,731	352		8,083
	Miscellaneous	248	690	1,639		2,329
	Stream	2,103	41,814	334	27,709	69,857
	All Types	15,505	190,677	106,614	53,108	350,399
Third	Plantation (1940-44)	211	147	1,111		1,258
	Cutover (1920-39)	1,651	11,712	25,362		37,074
	Reproduction (1910-39)	1,528	11,720	23,853		35,573
	Pole	495	8,497	21,477		29,974
	Mature	436	7,107	40,899		48,006
	Miscellaneous	368	862	375		1,237
	Stream	74	6,257	162		6,419
	All Types	4,763	46,302	113,239		159,541
All Workings	Burn (1945-49)	243	11,990	99,760		111,750
	Cutover (1940-44)	223	28,656	157,111		185,767
	Plantation (1940-44)	239	400	5,190		5,590
	Cutover (1920-39)	2,469	107,395	38,497		145,892
	Reproduction (1910-39)	5,999	103,764	476,638	23,312	603,714
	Pole	10,259	90,057	63,721	2,087	155,865
	Mature	1,231	29,925	42,192		72,117
	Miscellaneous	959	17,818	280,431	130	298,379
	Stream	2,378	68,993	714	27,940	97,647
	All Types	24,000	458,998	1,164,254	53,469	1,676,721

TABLE 7

SUMMARY OF RIBES ERADICATION, 1923 - 1946
KANIKSU OPERATION

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre		Net Acreage Remaining	
						Man-Days	Ribes	Worked	Unworked
First	Burn	1945-49	243	548	111,750	2.26	460	243	
	Plantation	1945-49	30	17	1,598	.57	53	30	473
	Cutover	1940-44	3,731	2,904	534,663	.78	143	3,731	45,303*
	Burn	1940-44	210	184	47,333	.88	225	210	
	Plantation	1940-44	2,631	1,317	490,404	.50	186	2,631	
	Cutover	1920-39	11,970	8,713	1,843,942	.73	154	11,396	24,583
	Reproduction	1910-39	165,918	119,065	32,755,662	.72	197	159,299	25,795
	Pole		123,459	43,044	6,052,712	.35	49	122,144	30,364
	Mature		142,498	30,621	5,799,102	.21	41	110,203	39,572
	Miscellaneous		7,297	4,905	1,992,482	.67	273	5,934	1,367
	Stream		22,482	49,533	9,282,358	2.20	413	21,838	7,334
	Total		480,469	260,851	58,912,006	.54	123	437,659	174,791
Second	Cutover	1940-44	352	199	7,107	.57	20	352	
	Plantation	1940-44	2,631	1,435	50,089	.55	19	2,631	
	Cutover	1920-39	6,638	8,838	1,759,832	1.33	265	6,638	
	Reproduction	1910-39	50,462	43,989	5,630,934	.87	112	49,554	
	Pole		27,724	12,264	849,607	.44	31	27,724	
	Mature		6,959	3,904	357,746	.56	51	6,959	
	Miscellaneous		1,056	509	43,394	.48	41	1,056	
	Stream		9,837	13,116	1,276,525	1.33	130	9,782	
	Total		105,659	84,254	9,975,234	.80	94	104,696	
Third	Plantation	1940-44	211	35	1,258	.17	6	211	
	Cutover	1920-39	5,273	4,424	299,559	.84	57	5,273	
	Reproduction	1910-39	15,409	14,997	1,158,938	.97	75	15,409	
	Pole		1,349	482	53,030	.36	39	1,349	
	Mature		900	607	102,271	.67	114	900	
	Miscellaneous		547	189	4,263	.35	8	547	
	Stream		1,182	1,540	68,134	1.30	58	1,182	
	Total		24,871	22,274	1,687,453	.90	68	24,871	
All Workings	Burn	1945-49	243	548	111,750	2.26	460	243	
	Plantation	1945-49	30	17	1,598	.57	53	30	
	Cutover	1940-44	4,083	3,103	541,770	.76	133	4,083	
	Burn	1940-44	210	184	47,333	.88	225	210	
	Plantation	1940-44	5,473	2,787	541,751	.51	99	5,473	
	Cutover	1920-39	23,881	21,975	3,903,333	.92	163	23,307	
	Reproduction	1910-39	231,789	178,051	39,545,534	.77	171	224,262	
	Pole		152,532	55,790	6,955,349	.37	46	151,217	
	Mature		150,357	35,132	6,259,119	.23	42	118,062	
	Miscellaneous		8,900	5,603	2,040,139	.63	229	7,537	
	Stream		33,501	64,189	10,627,017	1.92	317	32,802	
	Total		610,999	367,379	70,574,693	.60	116	567,226	

*Includes 8,500 acres 1945 and 1946 unworked cutover.

TABLE 8

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1923 - 1946
KANIKSU OPERATION

State	Class	Gross Acres	Man-Days	Total Ribes	Per Acre	
					Man-Days	Ribes
Idaho	EQ-Reg.	18,796	6,844	1,066,689	.36	57
	EQ-Coop.	145,650	56,877	11,164,879	.39	77
	EQ-Emerg.	99,041	68,851	11,333,497	.70	114
	FS-Reg.	42,807	41,780	4,908,067	.98	115
	FS-Emerg.	99,269	38,823	8,788,474	.39	89
	CCC	62,419	50,478	8,451,835	.81	135
	Total	467,982	263,653	45,713,441	.56	98
Washington	EQ-Emerg.	31,629	19,288	6,754,071	.61	214
	FS-Reg.	52,694	45,347	10,606,688	.86	201
	FS-Emerg.	36,366	14,386	4,013,260	.40	110
	CCC	22,328	24,705	3,487,233	1.11	156
	Total	143,017	103,726	24,861,252	.73	174
Total	EQ-Reg.	18,796	6,844	1,066,689	.36	57
	EQ-Coop.	145,650	56,877	11,164,879	.39	77
	EQ-Emerg.	130,670	88,139	18,087,568	.67	138
	FS-Reg.	95,501	87,127	15,514,755	.91	162
	FS-Emerg.	135,635	53,209	12,801,734	.39	94
	CCC	84,747	75,183	11,939,068	.89	141
	Total	610,999	367,379	70,574,693	.60	116

TABLE 9

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1923 - 1946
KANIKSU OPERATION

State	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Idaho	National Forest	175,923	38,681	3,595	218,199	59,786	235,709
	Public Domain	54			54	80	134
	Subtotal Federal	175,977	38,681	3,595	218,253	59,866	235,843
	State	103,263	23,562	11,728	138,553	31,774	135,037
	Private	65,340	13,911	2,328	81,579	44,747	110,087
	Subtotal Other	168,603	37,473	14,056	220,132	76,521	245,124
	Total	344,580	76,154	17,651	438,385	136,387	480,967
Washington	National Forest	86,047	26,992	7,028	120,067	34,601	120,648
	Subtotal Federal	86,047	26,992	7,028	120,067	34,601	120,648
	State	2,080			2,080		2,080
	Private	4,952	1,550	192	6,694	3,803	8,755
	Subtotal Other	7,032	1,550	192	8,774	3,803	10,835
	Total	93,079	28,542	7,220	128,841	38,404	131,483
Total	National Forest	261,970	65,673	10,623	338,266	94,387	356,357
	Public Domain	54			54	80	134
	Subtotal Federal	262,024	65,673	10,623	338,320	94,467	356,491
	State	105,343	23,562	11,728	140,633	31,774	137,117
	Private	70,292	15,461	2,520	88,273	48,550	118,842
	Subtotal Other	175,635	39,023	14,248	228,906	80,324	255,959
	Total	437,659	104,696	24,871	567,226	174,791	612,450

BLISTER RUST CONTROL WORK, MONTANA OPERATION, 1946

By
A. S. Skoglund, Operation Supervisor
R. E. Frey, Forester, Cabinet National Forest

INTRODUCTION

Blister rust control was conducted on the Cabinet and Kootenai National Forests of the Montana operation in 1946.

A total of 80,706 acres have been worked initially on the Cabinet Forest and 58,024 acres on the Kootenai Forest.

Practically all the work performed in the Kootenai this past season was initial work in pole class stands, whereas in the Cabinet the work was confined entirely to 1910 and 1919 burned-over lands.

Teen-age boys, Mexican Nationals and war veterans made up the larger share of personnel used on the project. The teen-age boys, as a class, were not as efficient as during the three previous seasons. War veterans were satisfactory with some being outstanding. No problems of rehabilitation and reorientation to blister rust control work were encountered. Due to an increase in the size of the program, it was necessary to train inexperienced men as foremen. These men should, in all cases, provide good supervisory personnel for coming seasons.

As has been the case for years, forest fires on and off the immediate forests required the efforts of all crews for varying amounts of time. These interruptions halt the orderly progress of work not only because of time lost when the men are actually on fire duty, but also due to the tremendous labor turnover immediately after their release from prolonged periods of fire suppression.

ORGANIZATION AND ADMINISTRATION

The respective forests were responsible for the administration and maintenance of the camps and technical supervision was provided by the Bureau of Entomology and Plant Quarantine.

The field organization was as follows:

Bureau of Entomology and Plant Quarantine	U. S. Forest Service
A. S. Skoglund, Operation Supervisor	Neil Fullerton, Forest Officer, Cabinet Forest
	R. E. Frey, Forest Officer
	H. E. Ahlskog, Forest Officer, Kootenai Forest
	E. W. Smith, Forest Officer

Camp Locations

Drainage	T.	R.	S.	Date Established	Date Closed	Class of Labor	Size
Cabinet National Forest							
Rainy Creek	19N	32W	13	May 27	Aug. 29	Boys	50
W.F. Big Creek	19N	30W	36	July 1	Sept. 23	Mex.	60
M.F. Big Creek	18N	30W	6	June 28	Sept. 11	Boys	33
Kootenai National Forest							
Burnt Creek	34N	33W	1	May 28	Aug. 29	Boys	45
Burnt Creek	34N	32W	5	June 8	Aug. 18	Boys	45
Red Top Creek	34N	33W	1	June 27	Sept. 3	Boys	33
Yaak River	34N	33W	10	May 20	Sept. 13	Boys	45

LOCATION AND DESCRIPTION OF AREAS

In the Cabinet Forest, work was performed in the Big Creek and Rainy Creek drainages. The work in Rainy Creek was a continuation of the 1945 work. The work in the middle fork of Big Creek completed last year's area around Rivers Peak and extended the area to provide protection on the west side of the plantation. In the West Fork of Big Creek the work area was extended westward on the upper plantation and northward to include a thrifty stand of white pine on a 1919 burn.

In the Kootenai Forest, initial work was accomplished in portions of the upper and lower sections of the Burnt Creek drainage. The lower areas are predominantly very thrifty white pine pole type. The upper areas are mainly white pine reproduction on a 1910 single burn with considerable debris on the ground. The working conditions are rather severe on this particular portion of Burnt Creek.

Both initial and rework were performed on Red Top Creek area. This stand is mainly a 50-year-old white pine pole type with the ribes population on the decline. With the exception of a small amount of rework along the main creek, all work was confined to a basin below Red Top Lookout.

In the Yaak River area, all work was confined to stream type. The west side was a rework job in wide stream type initially worked in 1935. Initial work was performed on the east side of the river. Some parts with high ribes population and severe working conditions were left to be bulldozed this coming season. The area along the Yaak River extends from the confluence of Fourth of July Creek, past Burnt Creek, Little Creek and Cyclone Creek and beyond Red Top and Lucky Creeks, all of which contains fine, thrifty pole stands.

METHODS AND EQUIPMENT

Standard methods were used throughout the season. Ribes petiolare was sprayed with the new weedicide, 2,4-D, R. triste with a double concentration of

Atlacide and R. lacustre in stream type with a solution of ammonium sulfamate.

A small patch of R. viscosissimum seedlings on cutover lands was sprayed with ammonium sulfamate in the fall of 1945 with very good results. On a check performed one year later, no ribes were found in those portions that were sprayed, whereas, in the unsprayed parts, some ribes were found. With suitable equipment, heavy concentrations of upland ribes can be effectively sprayed at lower costs.

CONTROL STATUS

The status of control in the Cabinet Forest has not materially changed during the last several years. Practically no infection was found in the transplant beds at Savenac Nursery. No infection was found in the two-year-old seed beds. Haugan Lookout area was originally worked in 1942 and reworked in 1945. No favorable year for the spread or intensification of rust has occurred since 1942 until this past season. Present results are very encouraging in that no appreciable infection has been found since working Haugan Lookout; however, the so-called "acid test" will occur next fall when the results of this past favorable spread year may be observed.

The removal, by flankers, of the scattered ribes in the 1924 plantation on Big Creek and the working of the area around Rivers Peak should afford protection from any further serious damage. The slopes across the Middle Fork from this plantation should be planted with Douglas fir and white pine to provide a screening and suppress ribes as well as to utilize the now idle land. This area was burned over in 1910 and reburned in 1919 with very little natural restocking having taken place.

The situation in the West Fork remains the same since practically all the 1946 work was first working immediately adjacent to worked areas. In the past, travel time and man power prohibited the working of areas beyond those originally worked. Very heavy concentrations of ribes were pulled in these areas and this will necessitate a further working in the near future. This additional work affords considerable protection to the thrifty stands in the original area.

Next season it is planned to do further work in the Upper Middle Fork. First working was performed over about two-thirds of the area in 1938 and 1939 with a small amount of rework in 1940. Very heavy spread of infection to white pine took place in the years 1937-1941, and the situation at that time was not very optimistic. Since then the rust has not intensified. Some of this stand was stagnated prior to infection but now the undamaged pines have been released and new reproduction is appearing. Initial work will be performed in reproduction and pole stands further up the drainage tying in with past workings to make a large contiguous block.

No post check was performed in the Kootenai Forest except that in the immediate vicinity of the areas worked in 1946. An extensive pine survey was run on several drainages in the Upper Ford district and in the Fisher River country.

No bodies of white pine were found in the Upper Ford district outside of the present control areas, although several drainages had scattered white pine reproduction and pole. A small stringer found in Basin Creek and one in Bunker Hill Creek were too small to warrant protection. Heavy infection may be found in stream type along the main Yaak River and immediately above the west and North Fork junction.

The west Fisher area contains some marginal blocks of white pine, especially in Trail and Standard Creeks. The white pine occurs in heavy stocking with larch, Douglas fir and lodgepole. The site is very rocky but the ribes and infection are light and scattered. In the Allen Peak country of the Silver Butte Fisher Area, a few small blocks of white pine reproduction extend up into the whitebark pine stands adjacent to the lookout. Very little infection was found in the whitebark pine with the area being substantially ribes-free. The drainage just east of the lookout contains the best body of pine with very little work being required to protect it. In the lower portions of the main drainages the scattered pine were heavily infected, especially in the damp sites.

No new infection was found in the Red Top and Cyclone Creek areas near Sylvanite. The Red Top area has been afforded considerable protection except in the drainage below Red Top Lookout where further work will be necessary in a few years.

A small amount of work was performed in main Burnt Creek with most of the ribes confined to stream type. Some pine infection was found along the stream near the junction of the south fork with the main creek. This area will be worked next year to forestall any serious damage. A small pocket of heavy infection was found along the stream in the Middle Fork of Grizzly Creek and this area will be worked next season. The pole stands north of the main drainage and west of Grizzly Creek are in very good condition with perhaps additional work being necessary only in the upper heavy brush areas. The area should be closely watched to observe whether or not there is any appreciable rust infiltration from this brush area and into the lower stands.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs by cooperative agency and type of appropriation is shown in the following tabulations:

TABLE 1

EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
MONTANA OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 4,561.33
Cabinet National Forest	Regular BLR-4	91,826.00
Kootenai National Forest	Regular BLR-4	80,904.78
Total		$177,292.11

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
MONTANA OPERATION

Item	Bureau of Entomology and Plant Quarantine Regular BLR-1-4	Cabinet National Forest Regular BLR-4	Kootenai National Forest Regular BLR-4	Total
Sal., perm. men	$4,154.20	$ 6,480.00	$ 5,631.38	$ 16,265.38
Wages, temp. labs.		63,821.00	50,884.85	114,705.85
Subs. supplies		14,998.00	12,623.57	27,621.57
Equipment	9.85	4,482.00	1,590.51	6,082.36
Travel & transp.	382.77	1,108.00	4,035.42	5,526.19
Other supplies	14.51	937.00	6,139.05	7,090.56
Total	$4,561.33	$91,826.00	$80,904.78	$177,292.11

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
MONTANA OPERATION

Forest	Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre	
							Man-Days	Ribes
Cabinet	First	Reproduction	1910-39	501	3,682	159,683	7.34	319
		Mature		80	10	374	.13	5
		Stream (1)		20	87	8,498	4.35	425
		Total		601	3,779	168,555	6.29	280
	Second	Reproduction	1910-39	43	117	2,386	2.72	56
		Stream (2)		4	18	4,045	4.50	1,011
		Total		47	135	6,431	2.87	137
	Third and Other	Reproduction	1910-39	308	297	6,771	.96	22
		Stream (3)		83	221	13,143	2.38	141
		Total		391	518	19,914	1.32	51
	All Workings	Reproduction	1910-39	852	4,096	168,840	4.81	198
		Mature		80	10	374	.13	5
		Stream (4)		107	326	25,686	3.05	240
		Total		1,039	4,432	194,900	4.27	188
Kootenai	First	Reproduction	1910-39	346	104	1,230	.30	4
		Pole		1,104	1,391	54,714	1.26	50
		Mature		95	5	57	.05	1
		Stream		240	1,358	40,574	5.66	169
		Total		1,785	2,858	96,575	1.60	54
	Second	Pole		25	17	1,493	.68	60
		Stream		110	217	15,234	1.97	138
		Total		135	234	16,727	1.73	124
	All Workings	Reproduction	1910-39	346	104	1,230	.30	4
		Pole		1,129	1,408	56,207	1.25	50
		Mature		95	5	57	.05	1
		Stream		350	1,575	55,808	4.50	159
		Total		1,920	3,092	113,302	1.61	59
All Forests	First	Reproduction	1910-39	847	3,786	160,913	4.47	190
		Pole		1,104	1,391	54,714	1.26	50
		Mature		175	15	431	.09	2
		Stream (1)		260	1,445	49,072	5.35	182
		Total		2,386	6,637	265,130	2.78	111
	Second	Reproduction	1910-39	43	117	2,386	2.72	56
		Pole		25	17	1,493	.68	60
		Stream (2)		114	235	19,279	2.06	169
		Total		182	369	23,158	2.03	127
	Third and Other	Reproduction	1910-39	308	297	6,771	.96	22
		Stream (3)		83	221	13,143	2.38	141
		Total		391	518	19,914	1.32	51
	All Workings	Reproduction	1910-39	1,198	4,200	170,070	3.51	142
		Pole		1,129	1,408	56,207	1.25	50
		Mature		175	15	431	.09	2
		Stream (4)		457	1,901	81,494	4.16	178
		Total		2,959	7,524	308,202	2.54	104

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	10	20	800
(2)	4	9	275
(3)	10	44	470
(4)	24	73	1,545

TABLE 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
MONTANA OPERATION

Forest	Working	Acres Worked By Forest Service		
		National Forest	Private	Total
Cabinet	First	598	3	601
	Second	47		47
	Third	342	49	391
	Total	987	52	1,039
Kootenai	First	1,751	34	1,785
	Second	40	95	135
	Total	1,791	129	1,920
All Forests	First	2,349	37	2,386
	Second	87	95	182
	Third	342	49	391
	Total	2,778	181	2,959

TABLE 5

RIBES SPECIES ERADICATED, 1946
MONTANA OPERATION

Forest	Working	Eradication Type	Acres	Ribes Species						Total Ribes
				Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes inerme	Ribes irriguum	Ribes triste	
Cabinet	First	Reproduction (1910-39)	501	107,553	52,130					159,683
		Mature	80	374						374
		Stream (1)	20	4,136	3,162	1,200				8,498
		Total	601	112,063	55,292	1,200				168,555
	Second	Reproduction (1910-39)	43	225	2,161					2,386
		Stream (2)	4			4,045				4,045
		Total	47	225	2,161	4,045				6,431
	Third and Other	Reproduction (1910-39)	308	5,767	1,004					6,771
		Stream (3)	83	4,104	1,486	5,227			2,326	13,143
		Total	391	9,871	2,490	5,227			2,326	19,914
	All Workings	Reproduction (1910-39)	852	113,545	55,295					168,840
		Stream (4)	107	8,240	4,648	10,472			2,326	25,686
		Mature	80	374						374
		Total	1,039	122,159	59,943	10,472			2,326	194,900
Kootenai	First	Reproduction (1910-39)	346	1,210				20		1,230
		Pole	1,104	53,885	829					54,714
		Mature	95	57						57
		Stream	240	38,547	71		605	1,351		40,574
		Total	1,785	93,699	900		605	1,371		96,575
	Second	Pole	25	1,493						1,493
		Stream	110	15,225	9					15,234
		Total	135	16,718	9					16,727
	All Workings	Reproduction (1910-39)	346	1,210				20		1,230
		Pole	1,129	55,378	829					56,207
		Mature	95	57						57
		Stream	350	53,772	80		605	1,351		55,808
		Total	1,920	110,417	909		605	1,371		113,302
All Forests	First	Reproduction (1910-39)	847	108,763	52,130			20		160,913
		Pole	1,104	53,885	829					54,714
		Mature	175	431						431
		Stream (1)	260	42,683	3,233	1,200	605	1,351		49,072
		Total	2,386	205,762	56,192	1,200	605	1,371		265,130
	Second	Reproduction (1910-39)	43	225	2,161					2,386
		Pole	25	1,493						1,493
		Stream (2)	114	15,225	9	4,045				19,279
		Total	182	16,943	2,170	4,045				23,158
	Third and Other	Reproduction (1910-39)	308	5,767	1,004					6,771
		Stream (3)	83	4,104	1,486	5,227			2,326	13,143
		Total	391	9,871	2,490	5,227			2,326	19,914
	All Workings	Reproduction (1910-39)	1,198	114,755	55,295			20		170,070
		Pole	1,129	55,378	829					56,207
		Mature	175	431						431
		Stream (4)	457	62,012	4,728	10,472	605	1,351	2,326	81,494
		Total	2,959	232,576	60,852	10,472	605	1,371	2,326	308,202

TABLE 6

SUMMARY OF RIBES ERADICATION, 1928-1946
MONTANA OPERATION

Forest	Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes	Net Acreage Remaining Worked	Net Acreage Remaining Unworked
Cabinet	First	Reproduction	1910-39	35,431	36,803	6,420,851	1.04	181	34,862	6,214
		Pole		25,959	9,213	1,745,385	.35	67	25,670	7,134
		Mature		9,377	4,457	1,064,702	.48	114	9,357	1,712
		Miscellaneous		4,900	2,230	596,499	.46	122	4,657	
		Stream (1)		5,039	16,098	3,626,108	3.19	720	5,039	
		Total		80,706	68,801	13,454,045	.85	167	79,585	15,060
	Second	Reproduction	1910-39	5,642	8,590	802,327	1.52	142	5,642	
		Pole		1,108	1,423	101,767	1.28	92	1,108	
		Mature		28	27	1,799	.96	64	28	
		Miscellaneous		33	34	1,503	1.03	46	33	
		Stream (2)		2,994	5,413	562,398	1.81	188	2,994	
		Total		9,805	15,487	1,470,294	1.58	150	9,805	
	Third and Other	Reproduction	1910-39	1,622	1,376	90,549	.85	56	1,622	
		Pole		125	149	7,256	1.19	58	125	
		Stream (3)		2,994	3,842	187,325	1.28	63	2,994	
		Total		4,741	5,367	285,130	1.13	60	4,741	
	All Workings	Reproduction	1910-39	42,695	46,769	7,314,227	1.10	171	42,126	
		Pole		27,192	10,785	1,854,908	.40	68	26,903	
		Mature		9,405	4,484	1,066,501	.48	113	9,385	
		Miscellaneous		4,933	2,264	598,002	.46	121	4,690	
		Stream (4)		11,027	25,353	4,375,831	2.30	397	11,027	
		Total		95,252	89,655	15,209,469	.94	160	94,131	
Kootenai	First	Plantation	1945-49	244	125	5,462	.51	22	244	
		Cutover	1945-49							80
		Cutover	1940-44							5,739
		Cutover	1920-39	1,164	759	50,937	.65	44	1,164	3,761
		Reproduction	1910-39	13,584	8,847	1,081,191	.65	80	12,850	9,937
		Pole		21,802	9,489	923,368	.44	43	20,890	22,217
		Mature		17,172	4,377	594,415	.25	35	16,167	16,529
		Miscellaneous		346	95	7,956	.27	23	346	
		Stream		3,718	11,802	1,486,199	3.18	400	3,484	
		Total		58,024	35,494	4,154,528	.61	72	55,145	58,263
	Second	Reproduction	1910-39	716	367	30,680	.51	43	716	
		Pole		1,143	1,118	55,118	.98	48	1,143	
		Stream		767	1,911	99,522	2.49	130	539	
		Total		2,626	3,396	185,320	1.29	71	2,398	
	Third	Pole		133	276	10,360	2.08	78	133	
		Stream		22	14	738	.64	34	22	
		Total		155	290	11,098	1.87	72	155	
	All Workings	Plantation	1945-49	244	125	5,462	.51	22	244	
		Cutover	1920-39	1,164	759	50,937	.65	44	1,164	
		Reproduction	1910-39	14,300	9,214	1,111,871	.64	78	13,566	
		Pole		23,078	10,883	993,846	.47	43	22,166	
		Mature		17,172	4,377	594,415	.25	35	16,167	
		Miscellaneous		346	95	7,956	.27	23	346	
		Stream		4,501	13,727	1,586,459	3.05	352	4,045	
		Total		60,805	39,180	4,350,946	.64	72	57,698	
All Forests	First	Plantation		244	125	5,462	.51	22	244	
		Cutover	1945-49							80
		Cutover	1940-44							5,739
		Cutover	1920-39	1,164	759	50,937	.65	44	1,164	3,761
		Reproduction	1910-39	49,015	45,650	7,502,042	.93	153	47,712	16,151
		Pole		47,761	18,702	2,674,253	.39	56	46,560	29,351
		Mature		26,549	8,834	1,659,117	.33	62	25,524	18,241
		Miscellaneous		5,246	2,325	604,455	.44	115	5,003	
		Stream (1)		8,751	27,900	5,112,307	3.19	584	8,523	
		Total		138,730	104,295	17,608,573	.75	127	134,730	73,323
	Second	Reproduction	1910-39	6,358	8,957	833,507	1.41	131	6,358	
		Pole		2,251	2,541	156,885	1.13	70	2,251	
		Mature		28	27	1,799	.96	64	28	
		Miscellaneous		33	34	1,503	1.03	46	33	
		Stream (2)		3,761	7,324	661,920	1.95	176	3,533	
		Total		12,431	18,883	1,655,614	1.52	133	12,203	
	Third and Other	Reproduction	1910-39	1,622	1,376	90,549	.85	56	1,622	
		Pole		258	425	17,616	1.65	68	258	
		Stream (3)		3,016	3,856	188,063	1.28	62	3,016	
		Total		4,896	5,657	296,228	1.16	61	4,896	
	All Workings	Plantation	1945-49	244	125	5,462	.51	22	244	
		Cutover	1920-39	1,164	759	50,937	.65	44	1,164	
		Reproduction	1910-39	56,995	55,983	8,426,098	.98	148	55,692	
		Pole		50,270	21,668	2,848,754	.43	57	49,069	
		Mature		26,577	8,861	1,660,916	.33	62	25,552	
		Miscellaneous		5,279	2,359	605,958	.45	115	5,036	
		Stream (4)		15,528	39,090	5,962,290	2.52	384	15,072	
		Total		156,057	128,835	19,560,415	.83	125	151,829	

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	717	1,984	58,690
(2)	182	388	11,421
(3)	37	223	4,180
(4)	936	2,595	74,291

TABLE 7

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1928-1946
MONTANA OPERATION

Class	Gross Acres	Man-Days	Total Ribes	Gallons Spray	Per Acre	
					Man-Days	Ribes
EQ-Reg.	2,002	3,295	761,710	34,795	1.65	380
EQ-Emergency	66,076	30,787	5,775,415	1,330	.47	87
FS-Reg.	37,792	46,693	4,183,558	10,203	1.24	111
FS-Emergency	35,712	35,620	7,367,723	21,638	1.00	206
CCC	14,475	12,440	1,472,009	6,325	.86	102
Total	156,057	128,835	19,560,415	74,291	.83	125

TABLE 8

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1928-1946
MONTANA OPERATION

Forest	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Cabinet	National Forest	62,976	7,801	2,901	73,678	11,050	74,026
	Public Domain	40			40		40
	Subtotal Federal	63,016	7,801	2,901	73,718		74,066
	State	734	1		735		734
	Private	15,835	2,003	1,840	19,678	4,010	19,845
	Subtotal Other	16,569	2,004	1,840	20,413		20,579
	Total	79,585	9,805	4,741	94,131	15,060	94,645
Kootenai	National Forest	51,985	2,027	155	54,167	47,245	99,230
	State					173	173
	Private	3,160	371		3,531	10,845	14,005
	Subtotal Other	3,160	371		3,531	11,018	14,178
	Total	55,145	2,398	155	57,698	58,263	113,408
All Forests	National Forest	114,961	9,828	3,056	127,845	58,295	173,256
	Public Domain	40			40		40
	Subtotal Federal	115,001	9,828	3,056	127,885	58,295	173,296
	State	734	1		735	173	907
	Private	18,995	2,374	1,840	23,209	14,855	33,850
	Subtotal Other	19,729	2,375	1,840	23,944	15,028	34,757
	Total	134,730	12,203	4,896	151,829	73,323	208,053

BLISTER RUST CONTROL, MOUNT RAINIER NATIONAL PARK, 1946

By
M. C. Riley, Operation Supervisor

No ribes eradication work for the control of white pine blister rust was conducted on Mount Rainier National Park during the 1946 field season. This was in accordance with the plan as contained in the 1944 annual report, which plan contemplates proper spacing of reworkings so that full crew-seasons will be employed rather than small crews for shorter periods of time.

Two checkers were employed. While neither one had performed any checking work previously, they were both experienced in ribes eradication work, compass reading, and pacing, and were familiar with the areas to be covered. Because the checking job was not started until mid-July, all of the White River area was not covered, although the most important portion of White River and all of the Longmire-Silver Forest area were given a regular four per cent check.

In the course of the work 21 miles of upland check strip and 9.7 miles of stream type check were run on the Longmire-Silver Forest area, and 36.4 miles of upland strip and 5 miles of stream type check strip were run at White River. All strips were plotted on maps with a scale of 4 inches to 1 mile, and from these maps it will be possible to confine the next ribes eradication work to the small, individual pieces of ground which still have ribes remaining.

Since no ribes eradication work was performed during the 1946 field season, no progress tables are included. Tables showing cumulative results of ribes eradication can be found in the 1945 annual report.

RECOMMENDATIONS

On the basis of checking work performed during 1946, it is estimated that a crew of 25 effective field men employed for a full three-month period will be needed for ribes eradication and canker elimination work during the 1947 field season.

Expenditures for calendar year 1946:

Item	National Park Service Regular BLR-5
Personal Services	$ 956.23
Travel & Transportation	156.56
Communication Service	1.70
Supplies & Materials	28.22
Total	$1,142.71

BLISTER RUST CONTROL, GLACIER NATIONAL PARK, 1946

By
M. C. Riley, Operation Supervisor

The blister rust control program for the 1946 field season was concerned entirely with first working on the Oldman Lake area located in unsurveyed sec. 29, T. 32 N., R. 14 W. Montana Meridian.

Work was conducted from one camp which had a maximum of 25 workers in the field with a seasonal average of 18 effective workers. Ribes eradication was started on July 17 and was discontinued on September 5. A complete camp unit was rented from the U. S. Forest Service and all supplies and equipment were transported by pack train from Two Medicine Ranger Station to the campsite.

Under authority of the Secretary of the Interior, the crew worked a 48-hour week. No time was lost because of fire fighting.

Several factors contributed to the poor record made by this camp. A late spring necessitated postponing the packing and building of the camp. This, combined with misunderstanding regarding employment ceilings and the low wage schedule first used, caused considerable delay in getting a crew assembled. The camp was more uncomfortable than necessary and this had a very direct bearing on the poor camp morale. No experienced camp superintendent was available. The man finally selected was given a week's training on a Forest Service operation but his lack of experience and ability was reflected in the poor management of the field work. An experienced assistant foreman was secured in August for the remainder of the season.

Ribes eradication was initiated in the protection zone on the east end of the area where the heaviest concentration of ribes occurs. Because of prevailing wind currents, these ribes constitute the greatest threat to the white pine stand. The work in this protection zone was not completed during the 1946 field season. Portions of the worked area were fairly easy to clean up but difficult working conditions were encountered along small seepages and an old snow slide area where concentrations of ribes were intermingled with heavy brush and windfalls.

BLISTER RUST INFECTION

Scouting for white pine blister rust in previous years had revealed infections on white pine on the Lake McDonald, Two Medicine and Park Headquarters control units, along McDonald Creek, Fern Creek and on the North Fork of the Flathead River outside of any control units. During the past field season a limited amount of scouting revealed, aside from areas previously listed, infected white pine on the Oldman Lake control area where ten cankers were found on nine trees, which represents approximately two per cent of the total trees examined. Outside of any designated control area, new pine infection centers were located at Logan Pass where 19.4 per cent of the trees examined were infected and at Paradise Creek where 13 per cent of the examined trees were infected.

CONTROL STATUS

A very small amount of regular check was conducted this past season and this was confined to the Oldman Lake area. Therefore, there are no data which indicate any change of the control status on areas as listed in the 1945 Annual Report. The ribes eradication on the OldmanLake unit materially reduced the amount of live stem on the small acreage covered but because of the large numbers of ribes removed and the ground disturbance, this area will need at least two more workings. The portion of Oldman Lake area remaining to be worked should not entail so large a man-day per acre expenditure because there is considerable ribes-free acreage remaining and working conditions are not generally so severe where ribes do occur.

RECOMMENDATIONS

The 1945 Annual Report contains specific recommendations for work to be done on areas which had been worked up to that time. General inspection on these areas indicates that these recommendations still apply. Such a small amount of work was accomplished on the Oldman Lake area this season that for purposes of planning future workings it should still be considered as all needing initial work. Until the initial work is completed and the quality of that work is determined, it is not feasible to forecast the number and spacing of future workings.

The following recommendations and estimates for the 1947 field season are considered essential for the orderly progress of the work. Oldman Lake requires thirty effective field men for a complete two-month period. Two Medicine requires twenty effective field men for one month. East Glacier requires twenty effective field men for two months. One checker should be employed for the full field season. This is a larger program than was anticipated when the estimates contained in the 1945 report were made but is necessitated by the work at Oldman Lake falling behind schedule. It would appear feasible that the work at Two Medicine and East Glacier be worked by the same camp unit with a sufficient increase in workers to allow for a possible shortened season.

Checking work has fallen behind schedule during the past three years. There is sufficient checking work to be done to warrant the employment of a checker for the season and every effort should be made to meet this objective.

If it is desired to perform canker elimination in the Logan Pass infection, a crew can be made up from the eradication forces to perform this work.

RESULTS

The following tables show statements of expenditures, results of the 1946 field work and accumulative results for all work performed to date.

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
GLACIER NATIONAL PARK

Item	National Park Service Regular BLR-5
Personal Services	$10,177.44
Travel and Transportation	47.66
Communication Service	12.95
Rents	494.39
Other Structural Services	1,436.11
Supplies and Materials	305.33
Total	$12,473.88

TABLE 2

SUMMARY OF RIBES ERADICATION, 1946
GLACIER NATIONAL PARK

Area	Working	Eradication Type	Acres	Effective Man-Days	Ribes by Species: Ribes lacustre	Ribes by Species: Ribes viscosissimum	Total Ribes	Per Acre Basis: Man-Days	Per Acre Basis: Ribes
Oldman Lake	First	Reproduction	13	195	10,595	30	10,625	15.00	817
		Miscellaneous	74	440	30,713	58	30,771	5.95	416
		Stream	1	16	1,571		1,571	16.00	1,571
		All Types	88	651	42,879	88	42,967	7.40	488

TABLE 3

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1939-1946
GLACIER NATIONAL PARK

Working	Class	Acres	Effective Man-Days	Total Ribes	Per Acre Basis: Man-Days	Per Acre Basis: Ribes
First	NP-Reg.	350	952	80,122	2.72	229
	NP-CCC	2,633	2,833	323,841	1.08	123
	NP-CPS	658	1,020	120,335	1.55	183
	Total	3,641	4,805	524,298	1.32	144
Second	NP-Reg.	731	763	122,606	1.04	168
	NP-CPS	1,471	684	57,016	.46	39
	Total	2,202	1,447	179,622	.66	82
Third	NP-CPS	647	581	36,805	.90	57
All Workings	NP-Reg.	1,081	1,715	202,728	1.59	188
	NP-CCC	2,633	2,833	323,841	1.08	123
	NP-CPS	2,776	2,285	214,156	.82	77
	Total	6,490	6,833	740,725	1.05	114

TABLE 4

SUMMARY OF RIBES ERADICATION, 1939-1946
GLACIER NATIONAL PARK

Area	Working	Eradication Type	Acres	Effective Man-Days	Ribes by Species: Ribes lacustre	Ribes viscosissimum	Ribes setosum	Ribes inerme	Total Ribes	Per Acre Man-Days	Basis Ribes
Park Headquarters	First	Reproduction	358	204	9,869	6,472	15,666		32,007	.57	89
		Pole	284	122	13,428	15,364	8,967		37,759	.43	133
		Miscellaneous	39	119	9,411	21,340	8,353		39,104	3.05	1,003
		All Types	681	445	32,708	43,176	32,986		108,870	.65	160
	Second	Reproduction	230	47	2,877	581	562		4,020	.20	17
		Pole	350	102	387	964	566		1,917	.29	5
		Miscellaneous	39	52	13	973	67	2	1,055	1.33	27
		All Types	619	201	3,277	2,518	1,195	2	6,992	.32	11
	Third	Reproduction	134	70	446	143	161		750	.52	6
		Pole	127	190	1,716	3,535	903		6,154	1.50	48
		All Types	261	260	2,162	3,678	1,064		6,904	1.00	26
	All Workings	Reproduction	722	321	13,192	7,196	16,389		36,777	.44	51
		Pole	761	414	15,531	19,863	10,436		45,830	.54	60
		Miscellaneous	78	171	9,424	22,313	8,420	2	40,159	2.19	515
		All Types	1,561	906	38,147	49,372	35,245	2	122,766	.58	79
Two Medicine	First	Pole	593	645	40,145	2,705	1,723	8,646	53,219	1.09	90
		Miscellaneous	60	118	3,935	1,050	4,665	1,834	11,484	1.97	191
		Stream	54	480	30,429	438		12,592	43,459	8.89	805
		All Types	707	1,243	74,509	4,193	6,388	23,072	108,162	1.76	153
	Second	Pole	252	181	15,716	1,332	4,562	5,874	27,484	.72	109
		Miscellaneous	16	20	1,495	67		2,471	4,033	1.25	252
		Stream	32	156	46,233	14		25,259	71,506	4.88	2,235
		All Types	300	357	63,444	1,413	4,562	33,604	103,023	1.19	343
	Third	Stream	44	116	11,230	32		12,456	23,718	2.64	539
	All Workings	Pole	845	826	55,861	4,037	6,285	14,520	80,703	.98	96
		Miscellaneous	76	138	5,430	1,117	4,665	4,305	15,517	1.82	204
		Stream	130	752	87,892	484		50,307	138,683	5.78	1,067
		All Types	1,051	1,716	149,183	5,638	10,950	69,132	234,903	1.63	224
Lake McDonald	First	Mature	1,730	923	21,125	4,253	34,175		59,553	.53	34
		Stream	47	278	21,911	36	1,602		23,549	5.91	501
		All Types	1,777	1,201	43,036	4,289	35,777		83,102	.68	47
	Second	Mature	1,184	620	11,051	1,393	17,490		29,934	.52	25
		Stream	13	69	3,126	137	1,324		4,587	5.31	353
		All Types	1,197	689	14,177	1,530	18,814		34,521	.58	29
	Third	Mature	342	205	4,682	126	1,375		6,183	.60	18
	All Workings	Mature	3,256	1,748	36,858	5,772	53,040		95,670	.54	29
		Stream	60	347	25,037	173	2,926		28,136	5.78	469
		All Types	3,316	2,095	61,895	5,945	55,966		123,806	.63	37
East Glacier	First	Pole	367	1,005	44,305	14,739	11,042	65,936	136,022	2.74	371
		Stream	21	260	71	158		44,946	45,175	12.38	2,151
		All Types	388	1,265	44,376	14,897	11,042	110,882	181,197	3.26	467
	Second	Pole	86	200	21,816	2,492	9,507	1,271	35,086	2.33	408
	All Workings	Pole	453	1,205	66,121	17,231	20,549	67,207	171,108	2.66	378
		Stream	21	260	71	158		44,946	45,175	12.38	2,151
		All Types	474	1,465	66,192	17,389	20,549	112,153	216,283	3.09	456
Oldman Lake	First	Reproduction	13	195	10,595	30			10,625	15.00	817
		Miscellaneous	74	440	30,713	58			30,771	5.95	416
		Stream	1	16	1,571				1,571	16.00	1,571
		All Types	88	651	42,879	88			42,967	7.40	488
All Workings	First	Reproduction	371	399	20,464	6,502	15,666		42,632	1.08	115
		Pole	1,244	1,772	97,878	32,908	21,732	74,582	227,000	1.42	182
		Mature	1,730	923	21,125	4,253	34,175		59,553	.53	34
		Miscellaneous	173	677	44,059	22,448	13,018	1,834	81,359	3.91	470
		Stream	123	1,034	53,982	632	1,602	57,538	113,754	8.41	925
		All Types	3,641	4,805	237,508	66,643	86,193	133,954	524,298	1.32	144
	Second	Reproduction	230	47	2,877	581	562		4,020	.20	17
		Pole	688	483	37,919	4,788	14,635	7,145	64,487	.70	94
		Mature	1,184	620	11,051	1,393	17,490		29,934	.52	25
		Miscellaneous	55	72	1,508	1,040	67	2,473	5,088	1.31	93
		Stream	45	225	49,359	151	1,324	25,259	76,093	5.00	1,691
		All Types	2,202	1,447	102,714	7,953	34,078	34,877	179,622	.66	82
	Third	Reproduction	134	70	446	143	161		750	.52	6
		Pole	127	190	1,716	3,535	903		6,154	1.50	48
		Mature	342	205	4,682	126	1,375		6,183	.60	18
		Stream	44	116	11,230	32		12,456	23,718	2.64	539
		All Types	647	581	18,074	3,836	2,439	12,456	36,805	.90	57
	All Workings	Reproduction	735	516	23,787	7,226	16,389		47,402	.70	64
		Pole	2,059	2,445	137,513	41,131	37,270	81,727	297,641	1.19	145
		Mature	3,256	1,748	36,858	5,772	53,040		95,670	.54	29
		Miscellaneous	228	749	45,567	23,488	13,085	4,307	86,447	3.29	379
		Stream	212	1,375	114,571	815	2,926	95,253	213,565	6.49	1,007
		All Types	6,490	6,833	358,296	78,432	122,710	181,287	740,725	1.05	114

BLISTER RUST CONTROL, YELLOWSTONE NATIONAL PARK, 1946

By

M. C. Riley, Operation Supervisor
C. M. Chapman, Pathologist

Ribes eradication for the control of white pine blister rust in Yellowstone National Park consisted chiefly of initial work on the Mount Washburn area, although a small amount of work was also done on the Mammoth unit. Work started on June 17 and ended on September 4 and was performed by a maximum crew of 24 workers in the field, with a seasonal average of 15 men in the field. The crew was located at the Canyon Camp while working on Mount Washburn.

The work at Mammoth consisted of initial working on stream type in the protection zone on Glen Creek and second working in stream type in Clematis Gulch and in upland types principally on the south side of the pine area and protection zone. This second working was performed on areas where the initial work of 1945 was not of a satisfactory standard.

On the Mount Washburn unit first working was performed on the south end of the unit, and that portion of the area was worked from the south end of the protection area north to Dunraven Pass along the highway and to the west of the highway, and about one-quarter mile farther north on the east side of the area. Because of topography and prevailing wind currents, this section is considered as a vulnerable portion of the Mount Washburn unit.

A very satisfactory quality of work was performed. The almost continual change in personnel of individual crews made it impossible to develop the highly trained crew which functions best, especially in such extreme working conditions as are found in the rocky portion of the unit. As much as five man-days per acre were required on some parts, such as Dunraven Peak, while others were of such a nature that the average man-day requirements were well within reason. Considerable saving was effected by treating the crowns of decapitated rock-bound ribes with dry ammonium sulfamate.

In an effort to determine the effective dosage to be applied when using 2,4-Dichlorophenoxyacetic acid, commonly called 2,4-D, on Ribes petiolare as it occurs in Yellowstone National Park, test plots were established on Glen Creek. From these plots a satisfactory dosage can be determined after examination in the spring of 1947. This chemical is favored because of such factors as effectiveness, cost, transportation of chemical, and freedom from fire hazard and soil sterilization. Because the chemical is absorbed principally through the leaves rather than the roots, it is especially adaptable for use on ribes growing in streams and swamps, and these bushes have constituted a problem thus far in Yellowstone National Park.

Fire-fighting duties caused considerable interruption to the ribes eradication program. Approximately 18 per cent of the time when the crew was at top strength was spent on actual fire fighting, and the lost effectiveness is considerably higher when it is realized that this time is lost when crews are at their peak of efficiency and that it takes several days after such interruptions before the crew gets back to full production.

CHECKING, SURVEYS, AND SCOUTING

Very little regular check was performed. Enough frequent random inspections were made to indicate that a good quality of work was being done. Before any rework is planned, a complete 4 per cent check should be made. A few check strips were run on the southeast side of the Mammoth area to determine the work limits.

During the summer of 1945, representatives of the Director's Office, the Regional Office, local Park Service officials, and representatives of the Bureau of Entomology and Plant Quarantine inspected the Craig Pass area. It was decided that an intensive survey should be conducted to determine the location and amount of ribes on the area. This survey was made during the 1946 field season by a representative of the Bureau of Entomology and Plant Quarantine. Strips were run to give a 4 per cent sample and extended several miles east of a point one-half mile west of Isa Lake and included an area one-half mile wide on either side of the highway. During the course of the survey, a total of 48 miles of strip was run, and the resulting map shows the area needing ribes eradication. It is estimated that approximately only 400 acres would need working to protect a minimum of 3,000 acres of white pine.

During the course of the field season and after the ribes eradication work was completed, scouting of white pine and ribes was conducted to determine the spread of the rust. No blister rust infection was found on white pine on either control unit. Some five-needled pines were inspected outside of any control area, but no infection was found. Ribes infection was found again this year in the general vicinity of Mammoth. This was all outside of the control area on Glen Creek, Lava Creek, Slide Creek, Gardiner River, and Clematis Gulch above the protection zone, and near Gardiner, Montana. Determinations were made by the Division of Forest Pathology, U. S. Department of Agriculture, San Francisco, California. Ribes inspections were made at various other locations within the Park, but no other infection was found. These inspections were made at such widely distributed points as Mount Washburn, Craig Pass, West Thumb, Gibbon River, Norris Junction, Tower Falls, Grebe Lake, Lamar River, and Old Faithful. Since ribes infection was first discovered in Yellowstone National Park in 1944, increasing amounts have been found each year in the same general locations. This would indicate that there undoubtedly is white pine infection present in the immediate vicinity, and a more strenuous effort will be made next season to locate this center. It is evident that ribes eradication work on the Mammoth unit was started none too soon.

RECOMMENDATIONS

No ribes eradication work is anticipated on the Mammoth unit for the 1947 field season, with the possible exception of a few man-days on small isolated areas where seedlings may be a problem, and on one small patch of stream type where chemical may not have been properly applied.

For the Mount Washburn unit a 60-man field crew will be needed for the complete field season in order to complete the initial working.

If it is decided to protect the white pine on the Craig Pass unit, a crew of 30 field men would be required for a full month.

The proposed control area amounts to 8,778 acres, made up of the following units: Mammoth 1,578 acres; Mount Washburn 4,000 acres; Craig Pass 3,200 acres.

RESULTS

The following tables show statements of expenditures, results of the 1946 field work, and accumulative results of all work done to date:

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
YELLOWSTONE NATIONAL PARK

Item	National Park Service Regular BLR-5
Personal Services	$ 9,107.99
Travel & Transportation	377.62
Subsistence	749.93
Supplies & Materials	595.79
Total	$10,831.33

TABLE 2

SUMMARY OF RIBES ERADICATION, 1946
YELLOWSTONE NATIONAL PARK

Area	Working	Eradication Type	Acres	Effective Man-Days	Ribes by Species: Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes setosum	Ribes cereum	Ribes montigenum	Total Ribes	Gallons Spray	Per Acre Basis: Man-Days	Ribes	Gallons
Mammoth	First	Stream	11	46			9,090				9,090	881	4.18	826	80
	Second	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	6	14			2,295				2,295	175	2.33	383	29
		All Types	152	67			2,295	3,478	621		6,394		.44	42	
	All Workings	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	17	60			11,385				11,385	1,056	3.53	670	62
		All Types	163	113			11,385	3,478	621		15,484		.69	95	
Mt. Washburn	First	Mature	436	655	5,430	1,075				72,211	78,716		1.50	181	
All Areas	First	Mature	436	655	5,430	1,075				72,211	78,716		1.50	181	
		Stream	11	46			9,090				9,090	881	4.18	826	80
		All Types	447	701	5,430	1,075	9,090			72,211	87,806		1.57	196	
	Second	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	6	14			2,295				2,295	175	2.33	383	29
		All Types	152	67			2,295	3,478	621		6,394		.44	42	
	All Workings	Mature	582	708	5,430	1,075		3,478	621	72,211	82,815		1.22	142	
		Stream	17	60			11,385				11,385	1,056	3.53	670	62
		All Types	599	768	5,430	1,075	11,385	3,478	621	72,211	94,200		1.28	157	

TABLE 3

SUMMARY OF RIBES ERADICATION, 1945 - 1946
YELLOWSTONE NATIONAL PARK

Area	Working	Eradication Type	Acres	Effective Man-Days	Ribes by Species: Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes setosum	Ribes cereum	Ribes montigenum	Total Ribes	Gallons Spray	Per Acre Basis: Man-Days	Ribes	Gallons
Mammoth	First	Mature	1,562	913	4,132	2,329		62,720	12,211		81,392		.58	52	
		Stream	16	125	4,190	2	18,990	281	4		23,467	1,646	7.81	1,467	103
		All Types	1,578	1,038	8,322	2,331	18,990	63,001	12,215		104,859		.66	66	
	Second	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	6	14			2,295				2,295	175	2.33	383	29
		All Types	152	67			2,295	3,478	621		6,394		.44	42	
	All Workings	Mature	1,708	966	4,132	2,329		66,198	12,832		85,491		.57	50	
		Stream	22	139	4,190	2	21,285	281	4		25,762	1,821	6.32	1,171	83
		All Types	1,730	1,105	8,322	2,331	21,285	66,479	12,836		111,253		.64	64	
Mt. Washburn	First	Mature	436	655	5,430	1,075				72,211	78,716		1.50	181	
All Areas	First	Mature	1,998	1,568	9,562	3,404		62,720	12,211	72,211	160,108		.78	80	
		Stream	16	125	4,190	2	18,990	281	4		23,467	1,646	7.81	1,467	103
		All Types	2,014	1,693	13,752	3,406	18,990	63,001	12,215	72,211	183,575		.84	91	
	Second	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	6	14			2,295				2,295	175	2.33	383	29
		All Types	152	67			2,295	3,478	621		6,394		.44	42	
	All Workings	Mature	2,144	1,621	9,562	3,404		66,198	12,832	72,211	164,207		.76	77	
		Stream	22	139	4,190	2	21,285	281	4		25,762	1,821	6.32	1,171	83
		All Types	2,166	1,760	13,752	3,406	21,285	66,479	12,836	72,211	189,969		.81	88	

DEVELOPMENTAL WORK IN METHODS OF RIBES ERADICATION, AND PROGRESS OF RIBES ECOLOGY AND DISEASE CONTROL STUDIES IN THE NORTHWESTERN REGION FOR 1946

By
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R. T. Bingham, Agent; and H. R. Offord, Pathologist

FOREWORD

Activities of the developmental and improvement project BLR-1-6 for the calendar year of 1946 have included office, laboratory, greenhouse, and field work. The present annual report, as in past years, is primarily devoted to a discussion on field work. The material in this report is divided into three sections. Section I is a status report on the various field studies in methods of ribes eradication, problems of the ecology of ribes, and disease control investigations currently in progress. Section II is devoted to a discussion of these studies and the presentation of results. Section III is a report of laboratory and greenhouse activities and includes a listing of special reports and publications for the year 1946.

In section II, under Chemical Tests, are given the results of 1945 studies in the use of 2,4-dichlorophenoxyacetic acid as a herbicide, and a report on chemical investigations currently in progress. Recommendations are included for the practical field use of both 2,4-D and ammonium sulfamate (DuPont's Ammate). A progress report is presented on the studies of the ecology of ribes in relation to eradication control measures and timber management practices. Disease control investigations include a report on Hollywood Plot 9 by Stillinger. This is a study of damage from blister rust in a young stand of white pine reproduction. A brief summary of the Powder House Plot pruning study in the Clearwater National Forest also is presented.

A preliminary report of the establishment of a small Ribes lacustre bush study in the Coeur d'Alene National Forest is presented by R. T. Bingham. In addition, a brief report is made of a rust damage study to pole-sized western white pine in the St. Joe National Forest. Bingham was added to the Northwestern Region's Methods Project personnel in January of 1946 and will assist in the performance of ribes eradication studies, ecological investigations, and specialize in disease control problems having major importance to the ribes eradication program in the region.

I. SUMMARY

A. Tests of 2,4-Dichlorophenoxyacetic Acid for Ribes Eradication

1. Status of work. Field tests in 1945 of 2,4-D on R. petiolare, R. inerme, R. lacustre, and R. viscosissimum in Idaho were examined this season for effectiveness of kill. From the results dosages have been recommended for the practical field treatment of R. petiolare, the only species of high susceptibility to 2,4-D in the region. In Yellowstone National Park R. montigenum was found highly resistant to 2,4-D, but susceptible to ammonium sulfamate (DuPont's Ammate).

New compounds of 2,4-D in the form of sodium and ammonium salts, and the butyl ester liquid of 2,4-D were tested during the 1946 field season. A characteristic of this chemical, a plant growth hormone type of weed killer, is its high ecologic and plant species selectivity. Unfortunately, ribes species vary markedly in the degree of susceptibility to 2,4-D. As an illustration, R. petiolare is highly susceptible; R. viscosissimum moderately susceptible; and R. lacustre, R. inerme, and R. montigenum are moderately to highly resistant to 2,4-D. Field tests with this chemical were made this season in Idaho on R. viscosissimum and R. lacustre in the Kaniksu National Forest, and on R. petiolare and stream-type R. lacustre in the St. Joe National Forest. In Yellowstone National Park field studies were limited to the treatment of the single species R. petiolare.

Results from tests of 2,4-D on R. petiolare have been definitely satisfactory, and encouraging for R. viscosissimum seedlings if treatment is made before the development of much woody tissue characteristic of mature bushes. Likewise, there has been some evidence to indicate that 2,4-D is more effective on R. lacustre seedlings than on the mature bushes. From observations of this season's tests of 2,4-D on R. viscosissimum, definite plans are being formulated for large-scale practical field spray work in 1947 on cutover and burnt-over lands having an abundance of ribes seedlings. Treatment in all instances is expected to be confined to areas with a preponderance of R. viscosissimum seedlings (preferably those about two years of age).

Substances suitable as markers for 2,4-D spray solution were tested this season in California and in this region. The material Titanox B 30 was found the most satisfactory as a marker. Other types which have been tested mostly in California include Desert Whiting, Velvet White, Powdered Sulphur, and Weed-No-More Tracer, WP2621. Although some spreader has been added to the 2,4-D herbicides by their manufacturers, the amounts are not sufficient to give satisfactory wetting of the aerial plant parts of treated ribes. Tergitol No. 7 should continue to be added in the prescribed amounts to all spray solutions as a spreader, whether using 2,4-D or Ammate.

In addition to the use of the conventional knapsack chemical spray units for the establishment of test plots, a Buffalo Turbine Duster and Sprayer was experimentally employed to apply the butyl ester of 2,4-D in concentrated form. The acid equivalent strengths of the chemical for this study were 5,000 and 10,000 ppm. The test was established along the LaClerc Creek road in the Kaniksu National Forest. A 1939 cutover area was selected, having a preponderance of R. viscosissimum and a few R. lacustre bushes. The Buffalo Turbine Duster and Sprayer was borrowed from Pear Psylla Control in Spokane. Although designed for dust and spray work in orchards, good coverage of ribes was obtained with the chemical solution dispersed as a mist for distances of about one chain from the road. It required about 30 gallons to cover an acre, with actual spraying time amounting to about 25 minutes. As the nozzle is more or less stationary, difficulty was experienced in directing the spray solution to ribes locations. Redesigning of this machine or others on the market for spray work along forest roads has definite possibilities as an improvement in methods of control.

B. Ecological Studies of Ribes and Western White Pine

1. Status of work. Studies currently in progress on the ecology of ribes and western white pine are hereunder summarized. Time was largely devoted this season to timber sales work in coordinating cutting practices with the potential problems in the ecology of ribes. The major sale areas studied included Pass Creek in the Kaniksu National Forest, Steamboat Creek in the Coeur d'Alene National Forest, Fishhook Creek in the St. Joe National Forest, Martin Creek in the Cabinet National Forest, and the Sheep Mountain Sale in the Clearwater National Forest. Further investigations in direct seeding of western white pine were made this past season with the Forest Service.

(a) Plots on the study of variable light and moisture conditions on germination, growth, and development of upland ribes and white pine seedlings were again inspected for new germination. This is the sixth consecutive season of inspection and reporting on this study. Established in the fall of 1940, three light stations were selected to represent variable environments under full sun, half shade, and full shade conditions. At each of these light stations seeds of ribes and white pine were sown on natural duff, mineral, and burnt-mineral soil surfaces. In this annual report, under section II, FIELD WORK, Table 11, is presented the complete record for seed germination upon the various soil surfaces at the three light stations. Previous and more detailed discussions are given in the 1940 to 1945 annual reports.

(b) The study of longevity of ribes seeds after a logging disturbance was intensified during the current season. Interest in this study centers around the question of whether stored ribes seed undisturbed by logging or fire will continue to represent a potential population at some future date. One phase of the study involves the establishment of disturbance plots and the location of new disturbances caused by fire or relogging of previous cutover areas. The second phase involves the collection and screening of soil samples to recover stored ribes seed at various intervals of time succeeding the initial logging disturbance. This seed is then subjected to laboratory germination tests for the percentage of viability. Work on the latter project has been delayed until adequate laboratory facilities could be constructed in Spokane. The results of the disturbance plots in the field have been most encouraging. Any drastic change in the storage environment caused by opening the forest canopy will in turn affect ribes seed viability. The more drastic the change in soil temperature and soil moisture from the original cover conditions, the more pronounced the effect in the reduction of seed viability. The status of ribes seed germination from the data presented in the 1945 annual report remains unchanged.

(c) Studies of slash disposal measures in relation to ribes control problems were continued in cooperation with the Forest Service, Potlatch Forests, Inc., and the Slash Disposal Committee of the Inland Empire Section, Society of American Foresters. Further

evidence was gathered to substantiate the fact that partial disposal of slash materially reduces the ribes regeneration problem on new cutover lands. Besides the reduction in numbers of ribes, their distribution is limited to roadways, skid trails, landings, and fire breaks. An advantage of this restricted distribution is that an excellent opportunity is afforded for chemical spray treatment.

(d) Studies of the ecology of ribes relating to silvical practices in the western white pine type were currently continued in cooperation with Timber Management and the Northern Rocky Mountain Forest and Range Experiment Station, Forest Service. This season, as in the past few years, practically all work has been directed toward the determination of ribes potentials on proposed sale areas. This information, with that contributed by associates specialized in entomological and silvicultural problems, has permitted the basic cooperation so essential to the selection of the most desirable forest practices for the white pine type. This cooperative effort to coordinate all forest problems with cutting practices is being extended to all timber sales of white pine in the region. The Fishhook Sales Inspection on the St. Joe National Forest, representing five major drainages, was the largest of many such projects inspected this past season. Besides the representation of interested federal agencies in this inspection, Mr. Wm. J. Luma, Assistant Forester for the Northern Pacific Railway Company, Land Department, was a welcomed member in the party.

(e) Further studies were made this season to evaluate and systematize procedures for predetermining the problems in potential ribes populations. The following procedure is outlined for acquiring this information.

(1) Examine control operation maps and observe the status of ribes populations recorded from areas adjoining the sale or forest unit. Make an on-the-ground examination of adjoining areas to determine the characteristics in the occurrence of ribes as along ridge tops, by various exposures, by age classes of timber stands, and whether ribes distribution is uniform or of a patchy pattern.

(2) Examine sale area for ribes. Most favorable habitats are moist sites, game trails, rodent mounds, upturns, rock outcrops, pack and road trails, and at junction of two timber types. Current and one-year-old seedlings can usually be found germinating upon rodent mounds and along game trails in the densest of timber stands.

(3) Study fire history of area in relation to exposure. Note whether stand originated following a single or multiple burn. Single burn on a south or west exposure is a general index of light ribes potential. Multiple burns on other exposures must be in evidence to give similar index of light ribes potentials.

The intensity of burn in all cases will determine the extent of the potential ribes population. Determine the intensity of burn by noting the degree coarseness of charred materials in the forest floor mantle. Whether a single or multiple burn can be ascertained from fire scars, age variations of individual trees in the stand, and occasionally by the zonation of charred materials in the organic mantle.

(4) Study silvical characteristics of stand such as density, composition, and age. Ribes potentials become lighter as age of stand increases and in the more open type of stand if parent bushes or remnants thereof are not in evidence. A high proportion of Douglas fir and/or larch in a stand is a good indication of light ribes association except along ridge tops. A high proportion of white pine usually denotes an association of ribes.

(5) Observe compatibility of associated vegetation with ribes. Species of brush compatible with ribes are Ceanothus sanguineus, elderberry, willow, alder, maple, fool's huckleberry, honeysuckle, dogwood, and in most cases thimbleberry. Species of brush more or less incompatible and denoting sparse ribes populations are ninebark, kinnikinnic, ocean spray, bush snowberry, and Pachistima and C. velutinus when the latter two represent a high proportion of ground cover.

(6) Examine soil profile to determine the favorableness of the storage environment for longevity of ribes seeds. A thick, compact organic mantle favors longevity, while a shallow or loose insulating mantle is unfavorable. Likewise, a deep and heavy textured soil favors seed viability, while a shallow and sandy soil does not.

(7) Time permitting, ribes seeds can be exposed for germination in advance of logging by disturbing the forest floor on a unit basis of area (one milacre). The simplest procedure is to remove the litter and duff layers and mix the humus with the top inch of mineral soil. Scatter a few of these milacre disturbance plots throughout the proposed sale area. The number in relation to the sale acreage is not too important, as the purpose is only to determine the relative range in ribes population and the approximate pattern of distribution. The disturbance procedure can be substituted by recovering ribes seeds in the collection of soil samples, screening through 20 and 30 mesh hardware cloth, processing to a small residue, identifying, counting, and subjecting seed to laboratory germination tests. The latter method of recovering ribes seed is not recommended unless laboratory facilities are available for germination tests.

(f) Tests in direct seeding of both white and ponderosa pine were established this season to further the investigation on spot and broadcast seeding of preconditioned seed planted in early spring. One series

of tests was made in the Kaniksu National Forest and the other in the Coeur d'Alene National Forest. The seed cracking machine referred to in the 1945 annual report was constructed during the latter part of the 1946 field season. This machine will be tested during the winter months and all necessary preparations made for large-scale seeding studies in 1947. If arrangements can be made, some seed will be pelleted for broadcast sowing. It is planned to prepare a special report covering progress of work in direct seeding since 1943. Serial Report No. 115, entitled "Preliminary Report on the Use of Germinated Seed as a Method of Reforestation for Western White Pine," was issued in 1943.

C. Disease Control Plot Studies

1. Status of work. As in previous years, blister rust disease behavior on ribes was observed by Stillinger in relation to the probable infection of western white pine throughout the region. Heavy infection on ribes, combined with ideal weather conditions in early September, may have been responsible for more pine infection than has occurred in any year since 1941. Field work for the season was largely confined to inspecting all pine in Hollywood Plot No. 9. The number of cankers on both alive and dead trees was tabulated as to the year of origin. The year in which a tree died from blister rust was likewise recorded. The objective of this study is to obtain information on the development and damage of blister rust in young stands of white pine reproduction becoming established on cutover lands in association with the small number of residual ribes from eradication. In this particular study the number of ribes and feet of live stem are being maintained at the approximate level of adjoining control area of three workings. In addition to work on the Hollywood plot, an examination was made of paired trees in the pruning study on the Powder House plot. It was found that 13 of a total of 36 pruned trees had died since the establishment of the study. Four of the 13 had apparently died from root rot, five from a combination of root rot and beetle attack, and four were killed outright by the bark beetle. Twelve additional live trees were found infested with the beetle. No serious winter injury or summer scald was observed on any of the pruned trees.

A small R. lacustre bush study was established by Bingham in cooperation with the Forest Service in the Coeur d'Alene National Forest. The purpose of this study is to determine the infective potential of small ribes bushes residual after continued reworkings in relation to spread of the rust to white pine reproduction. A condensed discussion is presented of methods of study and climatological conditions for the area. Pine infection data and losses from blister rust during 1941 and later years are major topics in the report. The status of ribes after eradication work this season on the basis of a 20 per cent check is 32 bushes and 32 feet of live stem per acre. These are small bushes screened by surrounding vegetation. These ribes carry infection although a bush may have only three or four leaves. A brief report is included, covering the rust damage study to pole-sized white pine in the St. Joe National Forest.

IMPROVEMENT OF CHEMICAL METHODS FOR RIBES ERADICATION

Results of 1945 Tests

Ammonium sulfamate in the form of DuPont's Ammate (80% by weight of ammonium sulfamate, $NH_4SO_3NH_2$) and 2,4-dichlorophenoxyacetic acid were tested in the field during 1945. The Ammate was tested on a practical basis, employing power equipment for broadcast spray treatment.

Tests of 2,4-D on stream type Ribes petiolare and R. inerme plots located along the St. Maries River above the Fernwood Bridge, St. Joe National Forest, were given a final check in September, 1946. The results are tabulated in Table 1. These tests represent a series of spring, summer, and fall treatments to determine the effectiveness of variable strength solutions of 2,4-D in relation to seasonal changes in plant development. A 100 per cent kill resulted in the treatment of R. petiolare in all except the fall series of plots. One bush remains alive in plot 18 and the ten treated with one-fourth strength chemical solution in plot 17. An interesting phenomenon occurred in the fall series of plots, regarding post-seasonal toxicity of 2,4-D. An inspection in June and again in July showed only minor kill of R. petiolare in these plots. Practically all the mortality in plots 18 and 19 took place during the period between the July inspection and the final check in September. Observations of this chemical at work will often be discouraging until one becomes familiar with its characteristically slow action. The important fundamental in the use of 2,4-D on susceptible species of ribes is obtaining thorough coverage of all aerial stems and leaves. The reason is because the growth hormone is not translocated laterally to any extent by the plant. The treatment of stream type R. inerme in the same chemical series gave negative results, except for kill of live stem. This species is one of two in the region moderately to highly resistant to the chemical.

A series of 2,4-D treatments applied to R. lacustre on cutover lands in the LaClerc Creek drainage, Kaniksu National Forest, likewise gave negative results. This species and R. inerme are the two which have strongly resisted all tests of 2,4-D. Of the two species, R. lacustre is considered the more highly resistant to the chemical hormone. The types of treatments and results of live stem kill for the series of tests on R. lacustre are shown in Table 2. Except for killing an occasional current live stem shoot, no permanent injury resulted from the treatment by 2,4-D acid.

Tests similar to those on R. lacustre were established in the LaClerc Creek drainage on R. viscosissimum. The results are shown in Table 3. These are not too encouraging, except for the evidence from the summer series of treatments that higher concentrations of 2,4-D may increase the effectiveness of the chemical on R. viscosissimum. As the majority of bushes treated were five years or older in age, there is the possibility that younger bushes of a seedling age might be more susceptible to the chemical. Both these points were investigated during the current season. A report thereon is presented in the section "Herbicides Tested in 1946."

The results of practical field tests in which Ammate was broadcast-sprayed with power equipment on the Coeur d'Alene National Forest are shown in Table 4. A discussion of equipment, methods, and chemical for this study was previously presented in the 1945 annual report. The percentage of bushes killed with the strengths of Ammate solution tested were highest for ribes in the small-bush class and decreased as size of bush became larger. As an example, 74.3% of R. lacustre bushes less than six inches in height were killed in plot 1, while the percentage kill decreased to 14.9% for bushes over 3.1 feet in height. Satisfactory results in the use of Ammate on R. lacustre cannot be obtained under one pound of chemical per gallon of water. The main objective of this study was accomplished in that the test demonstrated the practicability of using power equipment for broadcast spray treatment of cutover lands inhabited with small ribes bushes.

TABLE 1

RESULTS OF 1945 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON R. PETIOLARE AND R. INERME, FERNWOOD BRIDGE PLOTS, ST. JOE NATIONAL FOREST, IDAHO

Plot No. and Date Treated		Composition and Concentration of 2,4-D Solution	Gallons Solution	Per Cent Ground Occupied by Ribes	No. Bushes Treated	No. Bushes Dead	Per Cent Kill of Live Stem
6/22	1	2,4-D 70% Dow Na Salt 1.43 oz. in 10 gals. water plus Tergitol #7	4	90	9 P. 2 I.	9 P.	100 60
	2		1	80	12 P.	12 P.	100
	3		3	20	4 P. 5 I.	4 P.	100 60
	4		2	40	10 P.	10 P.	100
	5	2,4-D 60% Dow Na Salt 1.67 oz. in 10 gals. water plus dilute NH_4OH to dissolve residue, plus Tergitol #7	2	50	12 P.	12 P.	100
	6		1	70	14 P.	14 P.	100
	7		4	75	5 P.	5 P.	100
	8		3	90	6 P.	6 P.	100
8/3	9	2,4-D 100% acid in 1% Carbowax 1.0 oz. in 10 gals. water plus Tergitol #7	2	40	8 P.	8 P.	100
	10		1	65	9 P.	9 P.	100
	11		4	50	10 P.	10 P.	100
	15		3	30	6 I.		80
	12	2,4-D 70% Dow Na Salt 1.43 oz. in 10 gals. water plus Tergitol #7	1	40	8 P.	8 P.	100
	13		4	30	9 P.	9 P.	100
	14		2	60	10 P.	10 P.	100
	16		3	40	8 I.		80
9/12	17	2,4-D 60% Dow Na Salt 1.67 oz. in 6 gals. water plus Tergitol #7	2 1/	70	10 P.		72
	18		2	80	8 P.	7 P.	99
	19		3	80	8 P.	8 P.	100
	20	2,4-D 60% Dow Na Salt 1.67 oz. in 6 gals. water plus furfural (4 tablespoons) plus Tergitol #7	1	40	4 I.		8
	21		2	30	10 I.		23
	22		3	30	7 I.		38

1/ Same chemical but 1/4 strength.

TABLE 2

RESULTS OF 1945 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON R. LACUSTRE, LACLERC CREEK PLOTS, KANIKSU NATIONAL FOREST, IDAHO

Plot No. and Date Treated		Composition and Concentration of 2,4-D Solution	Gallons Solution	Per Cent Ground Occupied by Ribes	No. Bushes Treated	No. Bushes Dead	Per Cent Kill of Live Stem
6/13	1	2,4-D 100% acid in 1% Carbowax	2	75	9		
	2	1.0 oz. in 10 gals. water	3	75	8		
	3	plus Tergitol #7	1	85	15		
	4a		4	50	6		
	b			60	5		
6/15	5	2,4-D 70% Dow Na Salt 1.43 oz.	1	50	4		
	6	in 10 gals. water plus	3	80	4		
	7	Tergitol #7	4	85	4		.5
	8		2	80	7		
8/9	17a	2,4-D 100% acid in 1% Carbowax	1	85	9		
	18a	1.0 oz. in 10 gals. water	2	80	7		
	19a	plus Tergitol #7	4	90	5		1.0
	20a		3	90	4		.5
					2-V.		
	21a	2,4-D 70% Dow Na Salt 1.43 oz.	3	95	5		2.0
	22a	in 5 gals. water plus Tergitol #7	2	85	6		1.0
9/10	26	2,4-D 60% Dow Na Salt 1.67 oz.	2 1/	35	6		
	27	in 6 gals water plus	3	80	5		
	28	furfural (4 tablespoons) plus Tergitol #7	2	70	14		

1/ Same chemicals used but 1/4 strength.

TABLE 3

RESULTS OF 1945 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON R. VISCOSISSIMUM AND UPLAND R. LACUSTRE, LACLERC CREEK PLOTS, KANIKSU NATIONAL FOREST, IDAHO

Plot No. and Date Treated		Composition and Concentration of 2,4-D Solution	Gals. Solution	Per Cent Ground Occupied by Ribes	No. Bushes Alive Before Treatment	No. Bushes Alive After Treatment	Per Cent Kill Bushes	Per Cent Kill FLS
6/14	9	2,4-D 70% Dow Na Salt 1.43 oz. in 10 gals. water plus Tergitol #7[1]	4	35	8 V. 1 L.	8 V. 1 L.		3
	10		3	50	34 V. 12 L.	34 V. 12 L.		2
	11		1	35	9 V. 7 L.	9 V. 7 L.		
	12		2	40	21 V. 2 L.	21 V. 2 L.		
	13	2,4-D 60% Dow Na Salt 1.67 oz. in 10 gals. water plus dilute NH_4OH to dissolve residue plus Tergitol #7	3	30	13 V. 5 L.	13 V. 5 L.		1
	14		4	40	14 V. 12 L.	13 V. 12 L.		2
	15		2	25	25 V. 4 L.	25 V. 4 L.		
	16		1	35	21 V.	21 V.		
8/10	17	2,4-D 70% Dow Na Salt 1.43 oz. in 5 gals. water plus Tergitol #7	3	40	30 V. 11 L.	16 V. 11 L.	46.7	68
	18		2	45	32 V. 2 L.	19 V. 2 L.	40.7	53
	19	2,4-D 100% acid in 1% Carbowax 1.0 oz. in 10 gals. water plus Tergitol #7	4	30	33 V.	17 V.	48.5	64
	20		1	20	24 V. 2 L.	19 V. 2 L.	20.8	12
	21		3	25	29 V. 1 L.	20 V. 1 L.	21.0	19
	22		2	30	28 V.	23 V.	17.7	15
9/10	23	2,4-D 60% Dow Na Salt 1.67 oz. in 6 gals. water plus furfural (4 tablespoons) plus Tergitol #7	1	40	28 V.	28 V.		
	24		2	40	24 V.	24 V.		1
	25		3	50	31 V. 1 L.	31 V. 1 L.		4
	25a		2[2]	30	36 V.	36 V.		

1/ In this and in all other tests Tergitol was used at the rate of about 1 tablespoonful for each 10 gallons of solution.

2/ Same chemicals used but 1/4 strength.

TABLE 4

RESULTS OF 1945 POWER BROADCAST SPRAY TESTS USING AMMATE ON R. LACUSTRE ON CUTOVER LANDS, COEUR D'ALENE NATIONAL FOREST, IDAHO

Plot No.	Bush Size in Feet	Per Acre: Alive Before Treatment — No. of Bushes	Per Acre: Alive Before Treatment — Feet of Live Stem	Per Acre: Alive After Treatment — No. of Bushes	Per Acre: Alive After Treatment — Feet of Live Stem 1/	Per Cent Kill — Bushes	Per Cent Kill — Live Stem
1	0- .5	857	293	220	39	74.3	86.7
4.75 Acres	.6-1.0	786	600	314	119	60.0	80.2
	1.1-2.0	678	981	411	249	39.4	74.6
(1/2 lb. Ammate	2.1-3.0	307	659	212	116	30.9	82.4
per gallon)	3.1+	485	2,516	413	979	14.8	61.1
	Total	3,113	5,049	1,570	1,502	49.6	70.3
2	0- .5	650	247	525	93	19.2	62.3
.45 Acres	.6-1.0	525	504	464	205	11.6	59.3
	1.1-2.0	175	338	162	123	7.4	63.6
(3/4 lb. Ammate	2.1-3.0	25	68	18	40	2.8	41.2
per gallon)	3.1+	525	2,415	518	1,945	1.3	19.5
	Total	1,900	3,572	1,687	2,406	11.21	32.6
3	0- .5	744	260	742	245	.3	5.8
.93 Acres	.6-1.0	686	468	685	450	.2	3.8
	1.1-2.0	510	715	510	700		2.1
(1/4 lb. Ammate	2.1-3.0	278	639	278	605		5.3
per gallon)	3.1+	492	1,820	492	1,790		1.6
	Total	2,710	3.902	2,707	3,790	.1	2.9

1/ Includes approximately 1/4 new growth from 1946 resprouts.

RECOMMENDATIONS ON THE USE OF AMMATE FOR PRACTICAL RIBES ERADICATION WORK IN THE NORTHWESTERN REGION

(Summarizes best information available through the fall of 1946)

Grade or type of chemical to purchase is DuPont's Ammate containing 80% by weight of ammonium sulfamate plus inert materials. This is a toxic chemical, rapidly killing upon contact with plant tissue. Low soil moisture and high soil temperature in mid-season tend to reduce the effectiveness of Ammate as a herbicide. Always stress the importance of good ground coverage for the roots and root-crowns of ribes.

1. Ribes fairly heavy and uniformly distributed. Chemical solution will be applied by knapsack or power sprayer on a unit basis of area.

Ribes Species	Dosage Per Milacre
R. lacustre (stream)	1 gallon
R. lacustre (upland)	1.5 gallons
R. petiolare	1 gallon
R. inerme	2 gallons
R. viscosissimum	2 gallons

Instructions: Dissolve chemical at the rate of 1.0 pound of Ammate per one gallon of water. Add Tergitol #7 at the rate of one tablespoon for each ten gallons of spray solution. In treating two or more ribes species in a single operation, use the heavier ribes dosage, providing the importance of this species is about equal to its associate. First, spray the central crown of a bush or the central portion of a clump, applying the spray vertically downward into the soil, and horizontally across the basal portion of the stems for clumps of ribes. This treatment should moisten the ground area shaded by the bush or clump. Next, spray upward along the stems of individual bushes and radially toward the outer edges of clumps, wetting all stems and turning the nozzle upward to moisten the under surface of the leaves. Finish with a top application, wetting all leaves and stems to the point of dripping.

2. Ribes fairly light and sparsely distributed. Chemical solution will be applied by knapsack or smaller spray unit to individual bushes.

Ribes Species	Pounds of Ammate Per Gallon of Water
R. lacustre (stream)	1.0 pound Ammate
R. lacustre (upland)	1.5 pounds Ammate
R. petiolare	1.0 pound Ammate
R. inerme	2.0 pounds Ammate
R. viscosissimum	2.0 pounds Ammate

Instructions: Dissolve chemical in the amount of Ammate per one gallon of water prescribed for each species of ribes. In treating two or more ribes species in a single operation, use the heavier amount of Ammate for a species in the association. Add Tergitol #7 at the rate of one-half tablespoon for three to five gallons of spray solution. First spray the root crown of the bush, directing the nozzle to two or three sides of the crown. The ground area around the base of the bush should be thoroughly moistened. Next, wet all stems and turn nozzle upward to moisten the under surface of the leaves. Finish with a top application, wetting all leaves and stems to the point of dripping.

RECOMMENDATIONS ON THE USE OF 2,4-D FOR PRACTICAL RIBES ERADICATION WORK IN THE NORTHWESTERN REGION

(Summarizes best information available through the fall of 1946)

The type of 2,4-Dichlorophenoxyacetic acid herbicide to purchase will be governed by price and the conditions of use. It is available as a powder and as a liquid concentrate. The triethanolamine liquid concentrate is at present the cheapest on a comparable basis of acid equivalent solution. The dry powder (e.g. sodium salt of 2,4-D) should be used where mixing of chemical solution is done in open tanks or in power sprayer tanks and where ribes numbers are fairly heavy, requiring the use of a considerable quantity of chemical solution. The liquid concentrate (either butyl ester, iso-propyl ester, or triethanolamine) is recommended for light ribes work where spraymen will be spending most of their work time in travel and search. The liquid concentrate can be mixed with water directly in the spray tanks.

2,4-D is a plant growth hormone type of herbicide, killing by slow systemic action, the precise nature of which has not been fully established. The action is slow; consequently, symptoms of injury, followed by death, are seldom noticeable until the second or third week after spraying. Twisted and accelerated growth of the terminal shoots of ribes is the first sign of reaction. Leaves gradually fade and wither, turning yellowish-brown upon death. The cambium layer in the root crown may remain yellowish-green throughout the season of treatment. The effectiveness of 2,4-D is at its best in early season when plant growth is rapid and succulent. For this reason, 2,4-D should not be used for late season work beyond the first of September after growth ceases, plant becomes woody, and new buds begin to swell. Because the plant does not translocate this hormone in lethal amounts from one stem to another, IT IS NECESSARY to apply chemical solution to each stem and all leaves thereon. To assure maximum absorption of 2,4-D by a plant, always treat the basal stems thoroughly down to the ground line and root crown.

Always check to ascertain the percentage strength of 2,4-D contained in a powder or liquid compound before selecting the amount of chemical prescribed for treating ribes species from the recommendations.

The amounts of chemical have been adjusted for the percentages of 2,4-D in the various compounds on a comparable basis of acid equivalent solutions. In mixing 2,4-D spray solution, first add Tergitol #7 to water, next add chemical, and add last the marker Titanox B30.

Ribes petiolare: This species is highly susceptible to all 2,4-D compounds hereunder recommended. Add one teaspoon of Tergitol #7 as a spreader for each ten gallons of spray solution. Next, add the amount of chemical given in ounces for ten gallons of water. This represents a chemical concentration of 0.08% or 800 parts per million of 2,4-D acid equivalent solution. First, apply soil drench to root portions of bush at the rate of one gallon of spray solution per milacre or until soil becomes thoroughly moistened around root crown. Next, work up stems and spray undersides of leaves. Finish with a top application, wetting all stems and leaves to the point of dripping.

Chemical Composition	Ounces of Chemical for Ten Gallons of Water
60% Sodium Salt of 2,4-D	1.78 ounces
70% Sodium Salt of 2,4-D	1.68 ounces
82% Sodium Salt of 2,4-D	1.43 ounces
83-1/3% Ammonium Salt of 2,4-D	1.38 ounces
40% Butyl Ester Liquid of 2,4-D	3.34 liquid ounces

For mixing chemical in amounts smaller than for ten gallons of spray solution, the 40% Butyl Ester Liquid Concentrate of 2,4-D is recommended. A graduate in 1/4-ounce divisions can be used for measuring the required amount of liquid concentrate for the spray solution. The measurements hereunder prescribed are for an acid equivalent solution of 0.08% or 800 parts per million of 2,4-D. This is the required chemical concentration for the treatment of R. petiolare in stream type. Tergitol #7 can be added at the rate of about 1/8-tablespoon for three to five gallons of spray solution.

Gallons of Water	2,4-D
3	1.00 ounce
4	1.34 ounces
5	1.67 ounces

Ribes viscosissimum: Present recommendations are for treating young seedlings which are more susceptible to 2,4-D than their moderately-susceptible parents. Treatment should be confined to areas having a preponderance of R. viscosissimum seedlings, and the majority of these two years in age. Add one teaspoon of Tergitol #7 as a spreader for each ten gallons of spray solution. Next, add the amount of chemical given in ounces for ten gallons of water. This represents a chemical concentration of 0.20% or 2,000 parts per million of 2,4-D acid equivalent solution. Last, add 2.7 ounces of Titanox B30 as a marker, for each ten gallons of spray solution. First, apply soil drench to root portions of bush at the rate of one gallon of spray solution per milacre, or until the soil becomes thoroughly moistened around root crown. Next, work up stems and spray undersides of leaves. Finish with a top application, wetting all stems and leaves to the point of dripping.

Chemical Composition	Ounces of Chemical for Ten Gallons of Water
60% Sodium Salt of 2,4-D	4.44 ounces
70% Sodium Salt of 2,4-D	4.19 ounces
82% Sodium Salt of 2,4-D	3.58 ounces
83-1/3% Ammonium Salt of 2,4-D	3.44 ounces
40% Butyl Ester Liquid of 2,4-D	8.36 liquid ounces

HERBICIDES TESTED IN 1946

Tests with the plant growth hormone type of weed killer, 2,4-dichlorophenoxyacetic acid, were intensified during 1946 with new compounds available. These included a 60% sodium salt of 2,4-D, an 83-1/3 ammonium salt, and a 40% butyl ester liquid concentrate of 2,4-D. The increased solubility of the salts of 2,4-D eliminates any difficulty previously experienced in dissolving the chemical in low temperature water. On a comparative basis of acid equivalent strengths, the salt compounds of 2,4-D are lower in costs than the liquid ester forms of the acid. The only advantage in using a liquid concentrate would be for knapsack chemical tank work where mixing of the spray solution is done directly in the spray tank to avoid the establishment of a tub mixing station. For power spray work, where mixing is mechanical, the salt compounds of 2,4-D will afford a considerable saving in chemical costs. Likewise, the dry powder form should be used for knapsack work in heavy ribes concentrations where spray tanks are filled from a tub mixing station.

Data presented in Tables 5 to 10 summarize the field tests made with 2,4-D on R. petiolare, R. viscosissimum, and R. lacustre during the 1946 field season. The only species in the region found definitely susceptible to 2,4-D has been R. petiolare. Ribes lacustre, R. inerme, and R. montigenum are in a class moderately to highly resistant to the chemical. Ribes viscosissimum is moderately susceptible to 2,4-D. The degree of susceptibility of R. viscosissimum to 2,4-D will undoubtedly vary with age of bush as indicated by this season's treatment of young seedlings. However, final proof as to the susceptibility of R. viscosissimum seedlings and also R. lacustre seedlings must await a check of these tests in 1947.

Table 5 shows a series of spray and soil drench tests of 2,4-D compounds on R. petiolare and R. lacustre. The chemical concentrations for the early season tests were varied from 50 to 500 parts per million, acid equivalent strengths of 2,4-D. For the mid-season tests the chemical concentration was increased by intervals of 100 with strengths varying from 200 to 500 ppm. Table 6 represents a test to determine the effectiveness of high chemical concentrations of 2,4-D on R. lacustre. In this series the parts per million of 2,4-D were varied from 1,000 to 4,000 for the treatment of old, mature bushes.

Table 7 is a series of tests on R. petiolare and R. lacustre, employing for plots "A" to "D" the butyl ester of 2,4-D in combination with a summer emulsion oil to serve as a spreader and penetrating agency. For plots "E" to "H" the test involved hot and cold water extracts from leaves, stems, and roots of each species with the addition of butyl ester at the rate of 1,000 ppm to one gallon of the extract. Not shown in the table were two direct absorption tests: One involved the immersion of a single R. lacustre branch in a solution of 500 ppm, A.E., butyl ester of 2,4-D; and the other, a single R. petiolare branch in the same strength solution. This test was established on June 27. To test the effectiveness of leaf and stem coverage only, a clump of R. petiolare in mid-stream, with roots entirely submerged in running water, was sprayed with 500 ppm, A.E. of the butyl ester of 2,4-D.

In Table 8 is shown a series of spray and soil drench tests with the butyl ester of 2,4-D applied to R. viscosissimum and R. lacustre seedlings under four years in age. Both early and mid-season treatments were established. Six plots were employed for each series of seasonal tests with the chemical concentration varying from 500 to 3,000 ppm. Treatment of seedlings before the development of dense, woody tissue characteristic of mature bushes, and while fast growing, may increase the susceptibility of these two ribes species to 2,4-D. This seems highly probable from observations of tests this season, in which it appears that a 100 per cent kill of R. viscosissimum seedlings will be attained and an encouraging high percentage kill of R. lacustre seedlings treated with 2,4-D concentrations above 1,000 ppm. As previously mentioned, final proof of the effectiveness of 2,4-D treatment of seedlings must await the 1947 field season.

Table 9 is a series of tests with the same age class of ribes seedlings as employed in the previous study. In this test the method of spray application, as well as the parts per million of 2,4-D, was varied. Seedlings in the "A" series of tests were treated by complete coverage of leaves and stems only, the amount of solution being controlled to prevent dripping onto the ground. A rose-type garden mist sprayer was used for the application of the chemical solution in this test. In the spray and soil drench tests, series "B" plots, the conventional knapsack unit was employed to thoroughly cover the aerial portions of the seedlings and apply a soil drench. Differences in the quantity of solution used for each treatment are shown in the table. The chemical concentration of 2,4-D was varied from 1,000 to 9,000 ppm.

Experimental chemical work in Yellowstone National Park, Wyoming, was limited this season to tests of 2,4-D on stream-type R. petiolare. The chemical treatments are shown in Table 10. For the June or early season series of tests, the chemical concentrations were made identical to those under trial in Idaho. An inspection of the June-treated plots in early July revealed that differences in growth characteristics of these high elevation bushes from the same species in Idaho necessitated increasing the chemical strength of 2,4-D in solution to secure symptoms of toxicity associated with ultimate kill. Thus, for the July series of treatments, the chemical concentration was raised to a minimum of 500 ppm and increased to a maximum of 2,000 ppm.

TABLE 5

1946 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON R. PETIOLARE AND R. LACUSTRE, MIDDLEFORK ST. MARIES RIVER PLOTS, ST. JOE NATIONAL FOREST, CLARKIA, IDAHO

Plot No. and Date Treated		Composition of 2,4-D	Per Milacre					Per Cent Ground Occupied by Ribes
			Parts Per Million	R. petiolare		R. lacustre		
				No. of Bushes	Feet of Live Stem	No. of Bushes	Feet of Live Stem	
6/5	1	60%	50	11	275	1	35	85
	2	Sodium	100	9	225	1	20	80
	3	Salt	200	6	325			95
	4		500	6	225			70
	5	83-1/3%	50	7	300			80
	6	Ammonium	100	4	450			85
	7	Salt	200	9	250			75
	8		500	8	325			90
	9	40%	50	6	285			85
	10	Butyl Ester	100	10	275	2	50	85
	11		200	8	250	1	15	75
	12		500	13	375	40		90
7/30	13	60%	200	1	140	4	35	60
	14	Sodium	300	5	125			60
	15	Salt	400	2	150			60
	16		500	1	200			70
	17	83-1/3%	200	3	165	1	70	75
	18	Ammonium	300	4	180	1	10	80
	19	Salt	400	7	160			60
	20		500	7	150			50
	21	40%	200	4	310			90
	22	Butyl Ester	300	8	190	3	70	65
	23		400	4	150	1	95	65
	24		500	4	180			80

TABLE 6

1946 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON R. LACUSTRE, MIDDLEFORK ST. MARIES RIVER PLOTS, ST. JOE NATIONAL FOREST, CLARKIA, IDAHO

Plot No. and Date Treated		Chemical Composition of 2,4-D Acid	Per Milacre			Per Cent Ground Occupied by Ribes
			Parts Per Million	R. Lacustre		
				No. of Bushes	Feet of Live Stem	
6/5	1	40%	1,000	9	300	75
	2	Butyl Ester	2,000	11	325	70
	3		3,000	8	350	80
	4		4,000	5	275	65

TABLE 7

1946 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON R. LACUSTRE AND R. PETIOLARE, FILER CREEK, MIDDLEFORK ST. MARIES RIVER, ST. JOE NATIONAL FOREST, CLARKIA, IDAHO

Plot No. and Date Treated		Chemical[1]	Gallons Per Milacre	Ribes Per Milacre		
				No. Bushes	Feet Live Stem	Per Cent Ground Occupied
6/27	A	100 cc. E 50 cc. O	1	10 L.	210	25
	B	50 cc. E 50 cc. O	1	15 L. 1 P.	150 15	25
	C	25 cc. E 50 cc. O	1	23 L.	250	35
	D	10 cc. E 50 cc. O	1	20 L.	250	35
	E	12 cc. E Hot extract R. petiolare[2]	1	12 L.	500	80
	F	12 cc. E Cold extract R. petiolare	1	21 L.	300	60
	G	12 cc. E Hot extract R. lacustre	1	4 P.	500	100
	H	12 cc. E Cold extract R. lacustre	1	5 P.	400	80

1/ No spreader added to any of sprays. E = 40% butyl ester of 2,4-D. O = Volck Summer Emulsion Oil, heavy, as applied by the manufacturer.

2/ In plots E, F, G, and H, the butyl ester to make about 1,000 p.p.m. A.E. was added to one gallon of a previously prepared hot or cold water extract of leaves, stems, and roots of R. petiolare or R. lacustre.

TABLE 8

1946 SPRAY AND SOIL DRENCH TESTS WITH 40% BUTYL ESTER OF 2,4-D APPLIED AT THE RATE OF ONE GALLON PER MILACRE ON R. VISCOSISSIMUM AND R. LACUSTRE SEEDLINGS, HENDRICK'S BURN, LOWER WEST BRANCH OF PRIEST RIVER, KANIKSU NATIONAL FOREST, IDAHO

Plot No. and Date Treated		Per Milacre					
		Parts Per Million	R. viscosissimum		R. lacustre		Per Cent Ground Occupied by Ribes
			No. Bushes	Feet of Live Stem	No. Bushes	Feet of Live Stem	
6/12	1	500	18	21			20
	2	750	16	19			18
	3	1,000	18	35			20
	4	1,500	16	24	4	2	23
	5	2,000	13	28	1	1	20
	6	3,000	17	31	1	1	25
8/6	7	500	13	30			20
	8	750	16	38			25
	9	1,000	14	30	3	5	25
	10	1,500	17	45			30
	11	2,000	27	75			40
	12	3,000	19	60	1	10	35

TABLE 9

1946 AERIAL SPRAY VERSUS AERIAL SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON R. VISCOSISSIMUM AND R. LACUSTRE SEEDLINGS HENDRICK'S BURN, LOWER WEST BRANCH OF PRIEST RIVER KANIKSU NATIONAL FOREST, IDAHO

Plot No. and Date Treated	Type of Application	Acid Equivalent PPM	Pints of Solution	Ribes Species	No. Bushes	Feet Live Stem
8/7 1-A	Spray	1,000	2.0	R. vis.	25	37.5
				R. lac.	5	4.3
1-B	Spray and soil drench	1,000	11.5	R. vis.	25	31.0
				R. lac.	5	3.9
2-A	Spray	3,000	2.5	R. vis.	25	28.5
				R. lac.	5	4.7
2-B	Spray and soil drench	3,000	13.0	R. vis.	25	33.7
				R. lac.	5	4.5
3-A	Spray	5,000	3.0	R. vis.	25	29.3
				R. lac.	5	3.5
3-B	Spray and soil drench	5,000	12.5	R. vis.	25	23.8
				R. lac.	5	3.8
4-A	Spray	7,000	2.5	R. vis.	25	26.0
				R. lac.	5	4.2
4-B	Spray and soil drench	7,000	13.0	R. vis.	25	34.7
				R. lac.	5	6.3
5-A	Spray	9,000	3.5	R. vis.	25	39.5
				R. lac.	5	5.8
5-B	Spray and soil drench	9,000	13.5	R. vis.	25	43.5
				R. lac.	5	5.5

TABLE 10

1946 SPRAY AND SOIL DRENCH TESTS WITH BUTYL ESTER OF 2,4-D ON R. PETIOLARE, GLEN CREEK, YELLOWSTONE NATIONAL PARK, MAMMOTH HOT SPRINGS, WYOMING

Plot No. and Date Treated		Chemical Concentration and Spray Dosage		Ribes Per Milacre		
		Parts Per Million	Gallons of Solution	No. Bushes	Feet Live Stem	Per Cent Ground Occupied
6/20	1	50	1	5	252	73
	2	100	1	7	169	50
	3	200	1	6	47	15
	4	300	1	7	60	12
	5	500	1	3	34	12
	6	700	1	7	64	14
	7	50	2	8	35	7
	8	100	2	8	96	19
	9	200	2	9	135	24
	10	300	2	4	96	23
	11	500	2	4	33	5
	12	700	2	12	119	20
7/22	13	500	1	7	29	9
	14	750	1	8	22	9
	15	1,000	1	3	6	7
	16	1,250	1	7	31	14
	17	1,500	1	6	196	45
	18	2,000	1	8	258	41

The Effects of Variable Light and Moisture Conditions on the Germination, Growth, and Development of Ribes lacustre, R. viscosissimum, and Pinus monticola

Established in 1940, the major objective of this study was accomplished upon termination of the 1945 field season. Its purpose was to determine the comparative influence of environmental factors upon germination, survival, and growth of the region's two principal upland ribes species with western white pine under full sun, half shade, and full shade conditions. Seeds of ribes and white pine were sown at each of these light stations on natural duff, mineral, and burnt-mineral soil surfaces. Since the 1945 field season, attention has been directed toward observing each year's germination and to recover seeds at various intervals from the date of sowing for germination tests on viability under laboratory conditions. Previous discussions of this study are given in the Northwestern Region's annual reports 1940 to 1945.

Table 1, as in past years, shows the number of ribes and white pine seeds germinating by seasons, the total number of seed germinating, and the per cent of total seed sown germinating during the six years. Ribes seeds were sown in 1940 at the rate of 800 per square foot, representing 3,200 per sub-plot and totaling 16,000 for each plot or soil surface. White pine seed was sown at the rate of 100 per square foot, representing 400 per sub-plot and totaling 2,000 per plot or soil surface.

Ribes seeds have continued to germinate only under conditions of full shade. Of the two species, R. lacustre seed has germinated in significantly higher numbers under all environmental conditions throughout the six years of observations. The length of time ribes seeds will continue to germinate is definitely related to environment. Ribes seeds which were recovered by a screening process at the end of the 1945 field season are being tested for viability under laboratory conditions.

TABLE 1

NUMBER OF RIBES AND WHITE PINE SEED GERMINATING DURING THE SEASONS 1941, 1942, 1943, 1944, 1945 AND 1946; TOTAL SEED GERMINATING DURING THIS PERIOD AND PER CENT OF TOTAL SEED SOWN GERMINATING

Soil Surface	Plant Species	Light Intensity	Number Seeds Germinating by Seasons						Total Seed Germ.	% of Total Seed Sown Germ.
			1941	1942	1943	1944	1945	1946		
Duff	R. lac.	Full Sun	15	674	19	0	0	0	708	4.425
		Half Shade	42	1,348	239	12	0	0	1,641	10.26
		Full Shade	771	5,968	479	297	193	108	7,816	48.85
	R.visc.	Full Sun	16	2	0	0	0	0	18	.11
		Half Shade	54	1	0	0	0	0	55	.34
		Full Shade	288	0	68	15	9	2	382	2.39
	Western White Pine	Full Sun	20	6	0	0	0	0	26	1.30
		Half Shade	49	90	5	0	0	0	144	7.20
		Full Shade	841	212	37	0	0	0	1,090	54.50
Mineral	R. lac.	Full Sun	3,184	2,134	57	0	0	0	5,375	33.59
		Half Shade	2,725	6,078	367	16	0	0	9,186	57.41
		Full Shade	1,937	6,191	1,992	365	186	94	10,765	67.28
	R.visc.	Full Sun	1,322	7	0	0	0	0	1,329	8.31
		Half Shade	1,092	11	0	0	0	0	1,103	6.89
		Full Shade	1,083	0	3	18	7	3	1,114	6.96
	Western White Pine	Full Sun	883	14	0	0	0	0	897	44.85
		Half Shade	1,170	29	11	0	0	0	1,210	60.50
		Full Shade	1,434	44	21	0	0	0	1,499	74.95
Burnt-Mineral	R. lac.	Full Sun	1,966	5,967	23	0	0	0	7,956	49.72
		Half Shade	2,650	8,493	437	7	0	0	11,587	72.42
		Full Shade	2,233	6,326	1,183	52	39	21	9,854	61.59
	R.visc.	Full Sun	740	13	0	0	0	0	753	4.71
		Half Shade	1,556	19	0	0	0	0	1,575	9.84
		Full Shade	1,554	0	44	7	2	0	1,607	10.04
	Western White Pine	Full Sun	314	1	0	0	0	0	315	15.75
		Half Shade	1,200	39	7	0	0	0	1,246	62.30
		Full Shade	1,379	49	13	0	0	0	1,441	72.05

DISEASE CONTROL PLOT STUDIES

Infection Conditions During 1946

Weather conditions were favorable for the development of the rust on ribes during the summer of 1946. All plots showed an increase in the amount of rust present on ribes in late August over that present in previous years. Early September was especially favorable for pine infection. During the period September 2 to September 7, temperature and humidity conditions were continuously near optimum for pine infection. With ribes infection heavy and weather conditions favorable during this entire period, considerable pine infection may have occurred.

Results from Hollywood Plot 9

Most of the field work during the summer season of 1946 consisted of a thorough inspection of the pine on Hollywood Plot 9. This plot, established in 1938, is located in the southeast quarter of sec. 17, T. 37 N., R. 5 E., in the Clearwater National Forest. The plot is square, 4 chains on the side, or 1.6 acres. In 1939 the size was increased to 8 chains on the side, or 6.4 acres. Initial ribes eradication was performed in 1933, prior to logging. The timber was cut in 1934, leaving a small residue of suppressed pole-sized timber. Drastic opening of the stand has allowed an abundance of nearly pure white pine reproduction to develop. Their numbers vary from 60 to 1000 trees per square chain.

During the course of the study, an effort was made to locate and keep a record of all ribes germinating on the area and all infection of pine. All ribes have been inspected each year for the presence of white pine blister rust, with the amount estimated in square inches of infected leaf surface.

Ribes History. A summary of the history of the 335 ribes on the area is shown in Table 1. The column, "Ribes Found, New," represents the years in which particular ribes were found. These data do not have any relation to the age of the ribes since a careful check for bushes was not made each year. They do, however, show the difficulty of finding all ribes in any one year. This table shows that 37 ribes, or 11 per cent of the total number of bushes, have died to date. Also, 257, or 76.72 per cent, of the ribes were eradicated in order to maintain a definite number of bushes per acre on the plot. The last column tabulates the number of ribes left on the plot each year. These are the ones responsible for most of the infection developing each season.

Germination of Ribes. In order to obtain some information regarding the germination of ribes on the plot, the probable years of germination for part of the ribes are shown in Table 2. These data are available for about half the bushes, due to the fact that information was not taken for bushes eradicated early in the history of the plot, and because of the inability to determine year of origin accurately in several cases. From this table it is evident that the peak of germination was reached in the period 1935 to 1937. Occasional ribes have continued to germinate since 1937. All are Ribes viscosissimum.

Disease on Ribes. Annual plot inspections have been made during the latter part of August, the period when the rust is approaching maximum development. These

results are summarized in Tables 3 and 4, and show the amount of live stem found, the amount of live stem left, the amount of rust in square inches of leaf surface, and the amount of rust per foot of live stem. With reference to Table 3, it is noted that since 1942 an effort has been made to maintain live stem at a constant figure of approximately 60 feet for the plot, or an average of about 10 feet per acre. This has been accomplished by eradicating some of the bushes and pruning back others having an excessive amount of live stem. The height of bushes has been kept under one foot.

From Table 4, it is evident that the per cent of bushes infected has gradually increased since 1940. With few exceptions, the amount of rust per foot of live stem has also gradually increased. The greatest amount of infection, expressed in the per cent of bushes infected, the amount of rust per bush, and the amount per foot of live stem, developed in 1946.

Comparing the number of bushes left each year in Table 2, the feet of live stem in Table 3, and the per cent of bushes infected in Table 4 with the total amount of infection present and the amount per foot of live stem, there appears to be no correlation.

White Pine Infection. All the pine reproduction on the plot was inspected for blister rust infection in 1946. The only other year was 1940, in which all pine was inspected and showed 2.93 per cent of the trees infected.

TABLE 1

HISTORY OF RIBES BUSHES FOUND ON HOLLYWOOD PLOT 9 FROM 1938 TO 1946

Year	Ribes Found		Disposition of the Ribes Found		
	Total	New	Dead	Eradicated	Left
1938*	61	61	0	0	61
1939	229	168	1	144	84
1940	143	59	2	74	67
1941	76	9	5	1	70
1942	79	9	12	8	59
1943	68	9	3	6	59
1944	63	4	4	0	59
1945	61	2	8	2	51
1946	65	14	2	22	41
Total		335	37	257	

*Plot consisted of 1.6 acres in 1938, but was increased to 6.4 acres in 1939.

TABLE 2

AGE OF BUSHES

	Probable Year of Germination													
	1926	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	Total
No. of Bushes	1	1	2	10	34	40	31	13	8	4	2	1	4	151

TABLE 3

HISTORY OF RIBES INFECTION FOR PERIOD 1938 - 1946 FOR HOLLYWOOD PLOT 9

Year	Feet of Live Stem		Ribes Infected						Square Inches of Infection	
			Found			Left				
	Found	Left	No. Inf.	Not Inf.	No Data	No. Inf.	Not Inf.	No Data	Found	Left
1938*	141' 7"	140' 6"	45	7	9	45	7	9	No Data**	
1939	628' 0"	306'10"	65	19	145	65	19	-	No Data	
1940	475' 2"	187' 7"	74	61	8	24	41	2	304.45	190.92
1941	219' 0"	219' 0"	32	37	7	32	37	1	94.12	94.12
1942	252'10"	62' 5"	35	28	16	27	27	5	94.37	19.89
1943	100' 9"	59' 7"	44	19	5	41	16	2	39.28	21.88
1944	62' 6"	62' 6"	55	3	5	55	3	1	72.42	72.42
1945	75' 2"	73' 6"	42	10	9	40	10	1	61.22	57.60
1946	88' 3"	61' 1"	60	-	5	41	-	-	106.19	72.43

* Plot consisted of 1.6 acres in 1938, but was increased to 6.4 acres in succeeding years.

**Infection recorded only as light, medium, or heavy in 1938 and 1939.

TABLE 4

INFECTION ANALYSIS PER BUSH AND PER FOOT OF LIVE STEM BY YEARS

Year	Per Cent Ribes Infected		Square Inches of Infection			
			Per Bush		Per Foot of Live Stem	
	Found	Left	Found	Left	Found	Left
1938	86.54	86.54	?	?	?	?
1939	77.38	77.38	?	?	?	?
1940	54.81	36.92	2.26	2.94	.641	1.016
1941	46.38	46.38	1.36	1.36	.430	.430
1942	55.56	50.00	1.50	.37	.373	.319
1943	69.84	71.53	.62	.38	.390	.367
1944	94.82	94.82	1.16	1.16	1.159	1.159
1945	80.76	80.00	1.18	1.15	.814	.784
1946	100.00	100.00	1.77	1.77	1.203	1.186

Analysis of Pine Infection

Since this is one of the first plots established for which fairly complete records have been kept, the data have revealed considerable information regarding the progress of infection in young stands of white pine reproduction.

All trees infected have been tagged and the infection data recorded, making it possible to keep a fairly accurate record of the development of the rust on each pine. After the infected trees began to die, each was removed, and the record completed. Considering all trees which have died from blister rust and those infected but still alive, the approximate average per cent of the infection for the plot is 30.67. This is an increase of about ten times the infection found in 1940, largely due to the 1941 wave of infection. Considering only the living trees, the infection is 20.50 per cent. This latter percentage is approximately the same for all the area within the section surrounding the plot. The considerable difference in these two percentages is due to the trees which have died from the rust. A large number of these dead trees would not have been found or their existence known if careful records had not been kept of all infection found during previous inspections. From the practical viewpoint, this difference emphasizes the necessity of a careful canker analysis with reference to disease surveys to determine whether any change in the per cent of infection is due to balancing of new infection by the loss in death of infected trees. Using the per cent infection alone may lead to an erroneous interpretation of the results if many dead trees are missed on disease survey.

Detailed Analysis of Chain 15, Strip 1

To obtain information regarding the action of the disease on the plot, an analysis was made in detail of a small sub-plot (chain 15, strip 1) of the main plot.

Canker Analysis. To determine the years when infection took place, the cankers were tabulated according to the year of wood infected. Table 5 gives such an analysis for the sub-plot.

TABLE 5

SUMMARY OF CANKERS FOUND IN 1946 BY YEARS OF WOOD INFECTED

	Year Wood									
	1943	1942	1941	1940	1939	1938	1937	1936	1934	Total
Cankers	2	7	59	226	418	220	53	41	1	1,027

An interpretation of this canker pattern reveals that infection took place in 1937, 1940, and 1941, with light infection in 1943. Data from other parts of the plot showed that the infection recorded as 1943 was really from a small 1944 wave. A previous study of incomplete data showed the 1940 wave to be masked by infection occurring in 1941. However, complete data indicate very definitely that both 1940 and 1941 were favorable years for infection in this

area. Because of the close association of these two waves of infection, it is impossible to separate them in the following tabulations.

This canker analysis indicates that the young pine were first infected in 1937. Little aecial production from these young pine occurred until 1940, with the peak reached in 1941. The probability of a heavy liberation of aeciospores in 1940 is reflected in the considerable amount of rust per bush shown in Table 4. Also to be noted under the per cent of bushes infected in Table 4 is a decrease in the per cent of bushes infected, indicating a very localized spread of the rust from ribes to the pine. Ribes were quite small, averaging about two and one-half feet of live stem per bush.

Although the young pine were infected first in 1937, an examination of several of the trees in the overstory revealed infection of 1927 and 1933 origin. Some of these old cankers were still fruiting in 1943. Although most of the large trees were removed in 1934, enough were left with blister rust to thoroughly infect the ribes as they germinated. This probably accounts for the higher percentage of bushes infected in 1938 and 1939 shown in Table 4, as well as the general distribution of infection originating in 1937.

Distribution of Infection by Infected Trees. In order to learn how the disease is distributed among the pine for each of the infection years, all trees were classified according to the years infected or reinfected. The results are given in Table 6. Infected trees are also separated as to whether alive or dead.

TABLE 6

YEARS WHEN DISEASED TREES WERE INFECTED

Infection Years	Alive	Dead	Total
1941	109	181	290
1937	4	45	49
1941-37	12	22	34
1944-41	3	1	4
1944-41-37	1	-	1
Total	129	249	378
Per Cent	34.12	65.88	100.00

From this table, the lack of repeated infections on the same trees is quite evident, even though the source of infection was practically the same. Also, the heavy intensification which takes place once the rust is established, is evident by comparing the number of trees infected in 1937 with those infected in 1941. This tabulation shows no new trees infected by the 1944 wave, but some were found on other parts of the plot. Although nearly two-thirds of the trees infected in 1937 and 1941 have died, it is of interest to note that one-third of the trees infected in 1937 are still alive nine years after becoming infected. Although all of the infected trees will eventually die, it is surprising how long they will live before succumbing to the attack. Much of the killing is due to a combination of blister rust, parasitism, and gnawing by squirrels.

Reduction in Number of Cankers Due to Death of Trees. In order to determine the reduction in the number of cankers due to the death of parts of the tree, the number of cankers on both dead and alive infected trees was compiled according to the probable year of canker origin. The results are given in Table 7.

TABLE 7

DECREASE IN NUMBER OF LIVING CANKERS
DUE TO DEATH OF TREES

Tree Status	Number of Cankers by Probable Year of Origin			Total	Per Cent
	1944	1941-1940	1937		
Alive	8	433	26	467	45.47
Dead	1	489	70	560	54.63
Total	9	922	96	1,027	100.00

These data reveal that although 65.88 per cent of the trees have died, their death has eliminated only 54.63 per cent of the cankers. This is somewhat the opposite of what might be expected, as it is generally supposed that trees with the most cankers will die first.

Rate of Death. During the last three years, all dead trees have been removed and a record made of the probable year of death. Since the first year of this work, it has been possible to record tree death by almost exact years. For the years previous to the first removals, the year of death was determined as nearly as possible. Table 8 gives a summary of these results.

TABLE 8

YEARLY RATE OF DEATH OF INFECTED TREES

Year Infected	Year of Death							Total
	1946	1945	1944	1943	1942	1941	1940	
1941-1940	60	21	13	77	7	1	-	179
1937	2	2	3	21	30	4	2	64
Total	62	23	16	98	37	5	2	243*
Cumulative Total	243	181	158	142	44	7	2	
Cumulative Percentage	65.32	48.66	42.47	38.17	11.82	1.88	.54	

* Excludes data on six trees probably dead before 1940.

The general trend of the data indicates that more than ten years will be necessary before all the infected trees in the young reproduction stand will be killed.

Increase in Height-Growth After Infection

Though a tree may be fatally infected, it appears to grow at about the same rate as its uninfected neighbor. This rate of growth may continue until the foliage begins to fade and the tree is near death. In examining dead trees, an effort was made to determine the height of the tree when infected and the height at death. Although it was not possible to obtain this information for all dead trees, it was secured quite accurately for the majority. The data are divided into two parts--trees infected in 1940 and 1941, and trees infected in 1937. In each of the parts of the table, the trees are grouped according to the year of death. The heights for each group of trees when infected and when dead are totaled. From these data an average height figure is derived. The heights are quite variable, hence the average must be considered only as an indication of the probable actual heights. These data are tabulated in Table 9. (Although the basis is small, the results do show an interesting trend in most cases.)

TABLE 9

INCREASES IN HEIGHT AFTER INFECTION

	1946		1945		1944		1943		1942		Total	
	WI*	WD*	WI	WD	WI	WD	WI	WD	WI	WD	WI	WD
TREES INFECTED IN 1937												
No. Trees	2		2		3		18		19		44	
Sums Hts. Inches	44	91	16	65	36	102	220	560	168	412	484	1230
Ave. Ht.	22.0	45.5	8.0	32.5	12.0	34.0	12.2	31.1	8.2	21.7	11.0	27.9
Per Cent Increase in Ht.	206.82		406.25		283.33		254.58		245.24		254.05	
TREES INFECTED IN 1940 AND 1941												
No. Trees	60		17		10		58		6		151	
Sums Hts. Inches	821	1836	197	485	130	235	717	1532	66	84	1931	4172
Ave. Ht.	13.7	30.6	11.6	28.5	13.0	23.5	12.4	26.4	11.0	14.0	12.8	27.6
Per Cent Increase in Ht.	224.68		246.16		180.77		213.67		127.27		216.02	

* WI equals height when infected; WD, height when dead.

These data suggest that on the average, a tree, if infected before one foot in height, will double in growth before death. In some cases, height-growth may increase by four times before death. Since one-third of the infected trees on the area are still alive, much greater increases in height can be expected before death from the rust. Also, a better basis of judgment will be obtained by analyzing all plot data.

General Discussion of Purposes and Results from Hollywood Plot 9 Study

A major regional problem in blister rust control is the protection program necessary to assure the reestablishment and maturity of well-stocked western white pine stands on cutover lands. Evidence being accumulated points to the fact that the problem in the Clearwater exceeds, or at least equals, all other forests in the region. For one reason, climatic conditions are more favorable, more often and over longer periods of time for pine infection than in other parts of the region. Consequently, the waves of infection are generally more severe, and minor waves may occur only on this forest. For instance, a considerable amount of infection developed on the Clearwater Forest in 1943 and 1944, which did not occur to any extent on the other forests. Also, for some time it has been realized that blister rust infection for a particular wave year was more severe in the southern part of the white pine region than in the northern part. This difference has been ascribed to the presence of the black currant, R. petiolare; but with the elimination of most of this species, the difference is still present. Therefore, consideration must be given to the possibility that the difference is due to more favorable climatological conditions for the development of the rust. This difference may also have some influence upon the germination of ribes seed.

The object of the study on Hollywood Plot 9 is to follow the history of this representative cutover area to obtain information on the development and damage from rust in young stands of reproduction. The number of ribes and feet of live stem are being maintained at somewhat the same standard as on adjacent control area. At present all ribes are small and of a type difficult to find. Thus far, little damage from the rust has been done due to heavy pine stocking on the area. On less heavily stocked areas, the loss would be quite severe. Continuation of the study will determine the effect the few remaining ribes have upon stocking as trees become older. It will also determine for how long a time the appearance of new ribes will complicate the problem.

Sampling Study. The question often has been raised whether this plot could not be partially sampled to obtain information comparable to that secured by inspecting all the plot. With completion of such a study now in progress, the results will be issued as a separate report.

Notes on Pruning Experiment

To determine the effect of pruning the lower one-third of the height of trees 12 to 15 years old, 36 pairs of trees were established in 1945 on the Powder House Plot. One tree of each pair is pruned one-third its height, and the other used as a check. Diameter measurements were made at $2\frac{1}{4}$, $4\frac{1}{2}$, and $6\frac{3}{4}$ feet above the ground. Comparing measurements this year with last year indicates some decrease in diameter growth due to the pruning. This decrease is more pronounced the lower the measurement on the tree. Height measurements were not taken this year but will be recorded at the end of the experiment.

All of the trees pruned last year were examined again this year. Thirteen died during the early part of this season. An examination of these trees revealed that four had apparently died from root rot; five from a combination of root rot and beetle attack, Dendroctonus valens; and four were killed by the beetle

alone. In these latter cases, the beetle had girdled the trees at ground level. Their channels extended down each of the main roots of the tree for a considerable distance. In one case the channel extended 5½ feet down the root.

Twelve additional trees were found infested with the beetle.

No serious winter injury or summer burn was observed on any of the pruned trees.

METHODS AND FIRST-YEAR RESULTS, AMES CREEK SMALL BUSH STUDY

During the summer season of 1946, a R. lacustre small bush study was established on Ames Creek, Northern Rocky Mountain Forest and Range Experiment Station, Deception Creek Experimental Forest, near Coeur d'Alene, Idaho.

The North Fork of the Coeur d'Alene River, of which Ames Creek is a subdrainage, is a stream of some 30 miles in length, draining about four townships of western white pine timber land within the Coeur d'Alene National Forest. Conditions exist on the lower north and east-facing slopes of this river which combine to make a difficult problem in ribes eradication. These slopes support large populations of small, screened R. lacustre bushes, which are frequently passed over in hand eradication work. Failure of the average eradication crews to detect and remove these bushes has resulted in much of the area in the drainage failing to meet existing blister rust control standards. Economic limitations have made it necessary to question the value of continued reworkings in view of the unknown capabilities of such small ribes to spread the blister rust fungus to adjacent white pines.

Thus, it became the purpose of this study to determine the infective potential of small R. lacustre bushes remaining after the performance of hand eradication work on an area typical of the North Fork drainage. A 34-acre study area, located on Ames Creek (Experiment Station Silvical Plot No. 61), representative of the desired working conditions, was chosen. The area lies on a northeast-facing slope, enclosed on three sides by well-defined, timbered ridges, and on the fourth by a steep valley bottom. These topographical factors combine to make the study area relatively well protected with respect to long-distance spread of the blister rust from other drainages or from the opposite slopes of Ames Creek (Figures 1 & 2). The study area was known to support a heavy concentration of small R. lacustre bushes, either originating after experimental cutting and burning of several years ago, or remaining after a previous eradication working. It was also known to support a moderately well-stocked stand of western white pine reproduction mostly under ten years of age and already infected by the blister rust fungus. In addition, the area was scheduled for eradication reworking during the summer of 1946 so that detailed eradication information would be available.

Methods

A systematic, line-plot method of sampling was employed. Four staked, one-fifth chain wide strips were laid out from creek bottom to ridge top at five-chain intervals within the study area (Figure 2). These sample strips totaled 55 chains in length (1.1 acres), with the more important light, temperature, and moisture variations of the study area being about equally represented.

Data concerning ribes location, height, exposure, live stem, and current season blister rust infection were recorded for each bush on the sample strips. Pine reproduction on the sample strips was examined to obtain data from which could be calculated the total and distributed stocking, the percentage of rust infection of the total stocking, and the rust damage to the total and distributed stocking. Supplementary information on blister rust cankers was also recorded. Climatological data recorded at nearby Experiment Station Headquarters

were also examined to aid in the interpretation of past weather as it influenced pine infection on the study area.

Prior to the establishment and examination of the permanent sample strips, a ten per cent sample of the ribes eradicated during the 1946 working was examined to obtain information on the number and size of ribes on the area during the year 1941. This information was easily obtained by counting back along the yearly nodes of the ribes stems and measuring the live stem present in 1941. It was desired for comparison with 1941 pine infection data as an indication of the amount of infection which might be expected to originate from a known number of small ribes during a year especially favorable to rust spread. Other supplementary information was obtained from a 20 per cent check for ribes applied to the study area immediately following eradication work.

Study Area History

The experimental project of logging the mature white pine timber previously covering the study area slope was established by the Experiment Station in 1935. Logging was done in alternate clearcut and shelterwood strips. When completed, three shelterwood strips four to five chains wide, separated by two clearcut strips four to seven chains wide, remained (Figure 1). About 70 per cent of full sunlight passed through the shelterwood canopy. Slash on the shelterwood strips was piled and burned in 1936; that on the clearcut strips was broadcast burned the same year. This single burn, combined with other favorable environmental conditions, caused ribes seed stored in the forest floor mantle to germinate abundantly. In 1938 Moss recorded 254 ribes seedlings per acre on the shelterwood strips and 622 ribes seedlings per acre on the clearcut strips. Over the entire area he found about five per cent of the seedlings infected with blister rust (approximately one leaf on every other bush infected).

Two ribes eradication workings had been undertaken on the study area prior to 1946. The initial working (1934) resulted in about six bushes per acre being removed from the 77 acres including and surrounding the study area. The second working (1939 & 1940) was performed soon after logging, while most of the ribes were one to three-year-old seedlings and quite difficult to detect. From 17 to 137 ribes per acre were removed in the second working.

In 1938 the Experiment Station established five reproduction transect lines on the area to determine the effectiveness with which mature white pines remaining on the three shelterwood strips would restock the ground beneath them and in the intervening clearcut strips. Average percentages of full four-milacre stocking as determined on these lines during 1939 and 1943 were 18 and 64, respectively.

From existing indications, blister rust entered the reproduction stand in 1937, establishing itself on a very few trees scattered over the study area. During the period from 1940 to 1944, the rust has intensified on pines around these original centers and spread generally to ribes and pines over the entire area.

Figure 1. Deception Creek Experiment Station, Silvical Plot No. 61, showing the three shelterwood strips separated by clearcut strips. Sample strips I and III fall mostly in the open on the clearcut areas while strips II and IV fall mostly in the semi-shade of the shelterwood areas.

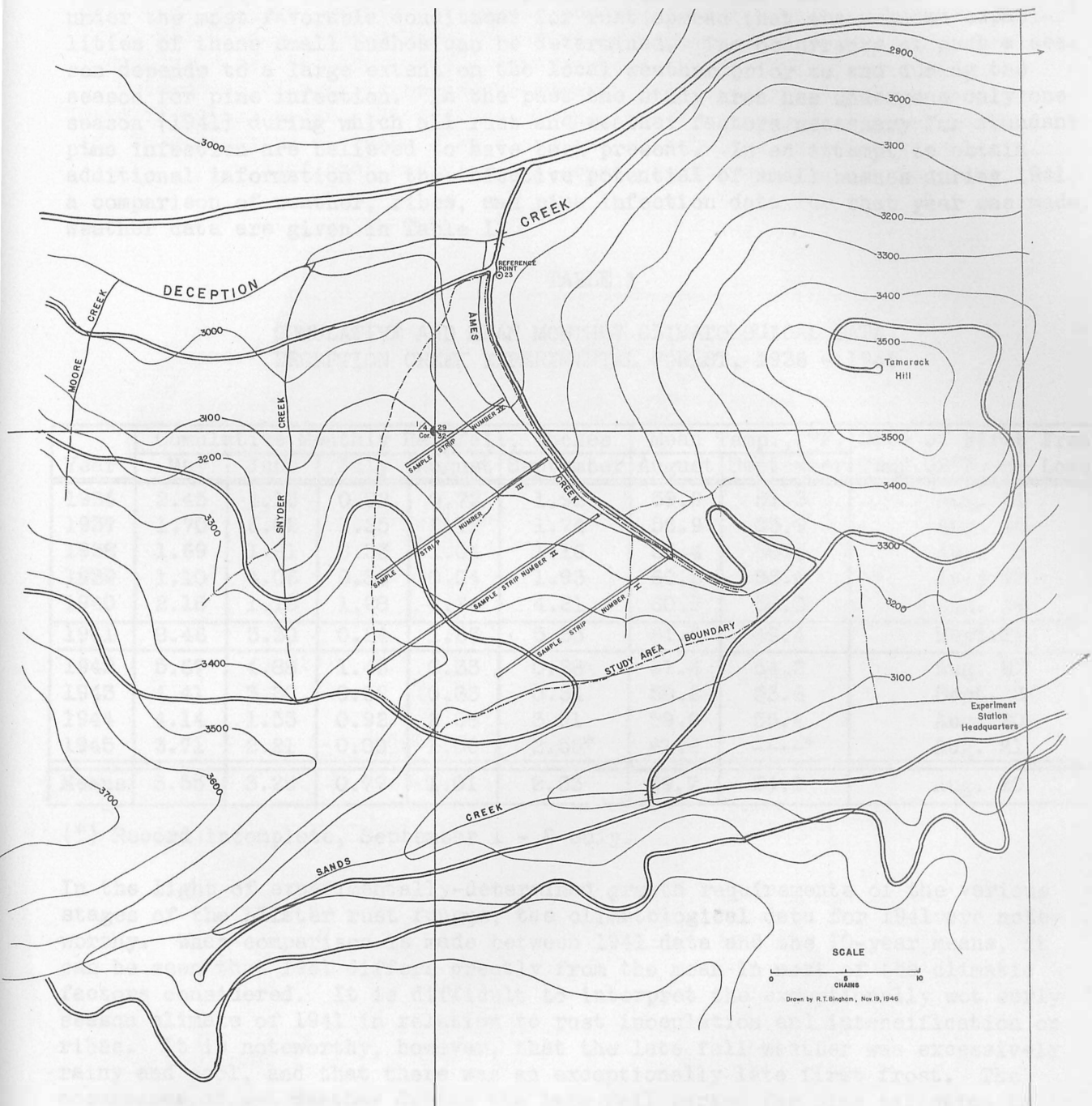


FIGURE 2.

AMES CREEK AND VICINITY SHOWING THE RIDGE AND STREAM BOUNDARIES OF THE 34-ACRE STUDY AREA AND THE FOUR PERMANENT SAMPLE STRIPS.

Discussion and First-Year Results

Climatological Data, 1936 to 1945. The completion of this study depends on the occurrence of a season extremely favorable for pine infection. It is only under the most favorable conditions for rust spread that the unknown capabilities of these small bushes can be determined. The occurrence of such a season depends to a large extent on the local weather prior to and during the season for pine infection. In the past the study area has undergone only one season (1941) during which all rust and weather factors necessary for abundant pine infection are believed to have been present. In an attempt to obtain additional information on the infective potential of small bushes during 1941, a comparison of weather, ribes, and pine infection data for that year was made. Weather data are given in Table 1.

TABLE 1

CUMULATIVE AND MEAN MONTHLY CLIMATOLOGICAL DATA,
DECEPTION CREEK EXPERIMENTAL FOREST, 1936 - 1945

Year	Cumulative Monthly Rainfall, Inches					Mean Temp., °F.		Date of First Frost
	May	June	July	August	September	August	September	Temp.32°F. or Lower
1936	2.45	4.13	0.92	0.72	1.92	59.9	51.3	Aug. 31
1937	1.70	6.02	1.25	2.12	1.74	56.9	53.9	Aug. 15
1938	1.69	1.91	0.33	1.04	1.16	57.4	58.5	Aug. 3
1939	1.10	4.06	0.85	0.04	1.93	60.5	53.6	July 17
1940	2.18	1.18	1.28	0.24	4.21	60.3	58.3	Aug. 14
1941	8.46	3.30	0.24	1.63	5.35	61.0	49.4	Sept.21
1942	5.67	4.88	1.43	0.33	0.28	61.4	54.2	Aug. 27
1943	4.41	3.30	0.52	0.83	0.34	58.2	53.6	Sept. 3
1944	4.14	1.53	0.92	2.08	3.91	59.0	55.4	Aug. 20
1945	3.71	2.21	0.00	1.06	2.55*	61.9	----*	Aug. 21
Means	3.55	3.25	0.77	1.01	2.33	59.7	54.2	Aug. 20

(*) Record incomplete, September 1 - 8 only.

In the light of experimentally-determined growth requirements of the various stages of the blister rust fungus, the climatological data for 1941 are noteworthy. When comparison is made between 1941 data and the 10-year means, it can be seen that 1941 differs greatly from the mean in most of the climatic factors considered. It is difficult to interpret the exceptionally wet early season climate of 1941 in relation to rust inoculation and intensification on ribes. It is noteworthy, however, that the late fall weather was excessively rainy and cool, and that there was an exceptionally late first frost. The occurrence of wet weather during the late fall period for pine infection is not in itself an assurance of extensive pine infection. It is believed that when exceptionally wet fall weather is preceded by a dry summer in which sporidial inoculum is not dissipated, and by a spring season characterized by the production of a large volume of aecial inoculum, a general and heavy spread of the rust from ribes to pine may be expected. This seems to have been the case

in 1941. August and September rainfall was twice that of the 10-year mean. The fall months were preceded by a dry summer and by a spring season during which many cankers of 1937 origin fruited for the first time.

The duration of the wet and cool periods during the period for pine infection is of more importance in limiting the extent of rust spread than is the overall amount of rainfall. Table 2 shows the fall season of 1941 to have been exceptional in respect to the total number of the continuous 24 to 36-hour rainy periods necessary to initiate pine infection. The dates and severity of early season frosts are included in the table as a possible indication of the termination of the pine infection season due to ribes defoliation.

TABLE 2

PERIODS OF WEATHER FAVORABLE FOR PINE INFECTION, AND FROSTS WHICH INDICATE TERMINATION OF THE PINE-INFECTION SEASON, DECEPTION CREEK EXPERIMENTAL FOREST, 1936-1945

Year	Dates of Favorable Weather		Total Days Favorable for Infection	Occurrence of Frosts	
	August	September		Dates	Temp. in °F.
1936	23-24	1-3	5	Aug. 31 Sept. 9 Sept.10	32 29 29
1937	1-2 8-9 23-24	4-5	8	Aug. 15 Aug. 16 Aug. 28	31 30 28
1938	13-14 17-19	5-9	10	Aug. 3 Aug. 9 Aug. 12 Aug. 13	32 31 32 29
1939	None	5-6 11-14	6	July 17 Aug. 7 Sept. 7 Sept. 8	32 32 31 30
1940	None	4-5 13-14 17-19 21-22	9	Aug. 14 Oct. 26	30 31
1941	26-28 31	1-4 9-15 19-20 25-26 29-30	21	Sept.21 Sept.22 Sept.28	32 30 24
1942	30-31	None	2	Aug. 27 Sept.12 Sept.15	32 32 28
1943	4-5 21-22	None	4	Sept. 3 Sept. 6 Sept. 8	29 31 28
1944	12-15	1-2 13-16 19-20	12	Aug. 19 Aug. 20 Aug. 21 Aug. 22 Sept.17	32 31 32 32 30
1945	13-14 25-27	4-6*	8*	Aug. 20 Aug. 21	29* 31

* Record incomplete, Sept. 1 - 8 only.

Characteristics of the Ribes Present on the Study Area in 1941. Data on the ribes removed in the 1946 working, inspected to determine 1941 and pre-eradication 1946 live stem of the study area, were interesting from the standpoint of ribes regeneration and development. However, these data could not be applied in determining the infective potential of a given number of small bushes during 1941. In taking the 10 per cent sample, a total of 640 bushes were examined. Of these, 617 were found to have been established seedlings prior to 1941. Table 3 shows the number and sizes of bushes present in 1941 and 1946.

TABLE 3

FREQUENCY DISTRIBUTION BY FEET OF LIVE STEM SIZE-CLASSES, AMES CREEK RIBES, 1941 AND 1946

Size-Class Feet of Live Stem	Number of Bushes Per Size-Class in 1941	Number of Bushes Per Size-Class in 1946
Seedling - 0.1	203	13
0.2 - 0.5	288	143
0.6 - 1.0	74	140
1.1 - 2.0	31	154
2.1 - 5.0	15	106
5.1 - 10.0	5	51
10.1 - 50.0	1	29
50.1 - 100.0	0	3
100.0 - Plus	0	1
Totals	617	640

It will be noticed that the sample contained 21 bushes having more than two feet of live stem in 1941. This means that there were approximately 6 bushes per acre of this size present on the study area in 1941. It is believed that a ribes population representative of the North Fork drainage would contain neither as many nor as large bushes as were found on Ames Creek where eradication work followed soon after logging.

Per acre totals were neither exceptionally high nor low for the North Fork area, the estimates being 180 bushes with 100 feet of live stem in 1941, and 187 bushes with 607 feet of live stem in 1946. It is interesting to note that only 23 (3.6 per cent) of the bushes became established after 1941. Under conditions existing during and after the opening of the mature stand, it could be expected that the greater proportion of the stored ribes seed would germinate in a relatively short period of years. Between 1942 and 1946 live stem on the study area was estimated to have increased about six times, from 3,369 to 20,456 feet.

Pine Infection and Damage During 1941 and Later Years. A sufficient number of cankers of 1937 origin was present on the study area during 1941 to effect a light but general infection of ribes then present on the area. Due to characteristic lack of uredial build-up on R. lacustre, there was probably not a great amount of rust intensification on ribes during late spring and summer. Infection of pine during the fall season, however, was probably disproportionately great due to almost optimal weather conditions persisting for nearly twice the normal

length of time. Table 4 shows the percentages of the total stocking infected during seasons in which it has been estimated that pine infection occurred.

TABLE 4

PERCENTAGE OF INFECTION OF TOTAL STOCKING BASED ON THE STOCK PRESENT DURING THE YEARS IN WHICH INFECTION PROBABLY OCCURRED

	Years in Which Infection Occurred				
	1937	1941	1943	1944	1946
Number of Trees on Sample Strips	104	501	567	575	587
Estimated Number of Trees Per Acre	95	455	515	523	534
Percentage of Infection	?	5.4	7.1	7.8*	7.8*
Residual Uninfected Stand Per Acre	95	430	473	482	492

* Percentages are low, as all cankers originating in later years are not visible.

The sudden increase in pine infection during 1941, and the more regular increase since that year are apparent. The Ames Creek reproduction stand is still on the increase, and the number of newly-established trees has exceeded the number infected each year. In young age classes of white pine like those on the study area nearly all infected trees will eventually succumb to the rust. Thus, in Table 4 an apparent loss of 7.8 per cent of the reproduction stand (about 42 trees per acre) will eventually occur. This percentage of loss to total stocking is compared below with similar figures calculated in view of stocking distribution.

TABLE 5

LOSSES TO THE TOTAL AND DISTRIBUTED STOCKING DUE TO PINE INFECTION BY THE BLISTER RUST FUNGUS

	1941		1946	
	Totals	Per-centages	Totals	Per-centages
TOTAL STOCKING LOSSES:				
No. Trees Surviving	475	94.8	545	92.8
No. Trees Lost	26	5.2	42	7.2
Total No. Trees	501	100.0	587	100.0
DISTRIBUTED STOCKING LOSSES:				
Basis 1,000 Trees Per Acre (Milacre Units)				
No. Units Stocked w/Surviving Trees	334	30.4	366	33.3
No. Units Stocked but Trees Lost	10	3.0	19	5.2
No. Units Unstocked	756	66.6	715	61.5
Total No. Units Examined	1,100	100.0	1,100	100.0
Basis 250 Trees Per Acre (4-Milacre Units)				
No. Units Stocked w/Surviving Trees	175	63.6	188	68.4
No. Units Stocked but Trees Lost	2	1.1	6	3.2
No. Units Unstocked	98	35.3	81	28.4
Total No. Units Examined	275	100.0	275	100.0

Damage to total and distributed stocking for trees examined on the four permanent sample strips is shown in Table 5. A small number of infected trees were found on which the cankers were judged harmless, so the percentages of damage shown in this table are slightly less than the percentages of infection shown in Table 4. The lost or damaged trees were found to be so distributed on the sample strips that they represent less loss to distributed than to total stocking. Up to the present time only 19 of 344 stocked milacre units on the sample strips represent a loss in the 1,000 trees per acre distributed stocking due to blister rust. Similarly, only 6 of the 194 stocked four-milacre units represent a loss in the 250 trees per acre distributed stocking. The percentages of trees lost from total stocking in 1941 and 1946 are almost twice as great as the percentages of occupied four-milacre units lost during the same years.

Average percentages of full four-milacre stocking as determined by the Experiment Station in 1939 and 1943 were 18 and 64, respectively; those determined in this study for 1941 and 1946 were 64 and 68, respectively. The differences in the percentages are probably caused by the fact that the Experiment Station records only trees six inches and taller, while in this study all pine reproduction, including established seedlings, was tallied.

In summarizing the results, it should be emphasized that estimations of blister rust losses to white pine stocking are based on nearly 600 trees, of which less than 50 were infected. From this small a sample it would seem that 1941 infection had but a slight effect in reducing the distributed stocking on the area. Later infection has about doubled the loss, but it is still so small that distributed stocking may be considered relatively undisturbed up to the present time.

Present Control Status of the Study Area and Sample Strip Ribes Data for 1946. At the conclusion of the 1946 eradication work a 20 per cent systematic sample (check) was made of the study area to determine the numbers and characteristics of the ribes remaining on the area. This large sample was taken to supplement information obtained from the sample strips. Data obtained from the 20 per cent check and from the four sample strips are compared in Table 6.

TABLE 6

CHARACTERISTICS AND DEGREE OF INFECTION OF RIBES EXAMINED DURING THE 20 PER CENT CHECK AND ON THE FOUR PERMANENT SAMPLE STRIPS, 1946

	20 Per Cent Check Ribes	Sample Strip Ribes
Total Number Bushes Examined	214.0	71.0
Average Number Bushes Per Acre	32.0	64.5
Total Feet of Live Stem Examined	213.6	46.5
Average Number of Feet of Live Stem Per Acre	32.0	42.3
Feet of Live Stem Per Average Bush	1.0	0.7
Height Above Ground of Average Bush (Ft)	0.5	0.4
Number of Leaves Per Average Bush	20.9	12.3
Per Cent of Bushes in Exposed Positions	11.2	12.8
Per Cent of Bushes in Half-Screened Positions	44.9	39.4
Per Cent of Bushes in Screened Positions	43.9	47.8
Per Cent of Bushes Infected	80.0	73.2
Per Cent of Leaves Infected Per Average Bush	--	38.3
Number Square Millimeters of Live Telia-Bearing Leaf Surface Per Average Bush	--	141.2

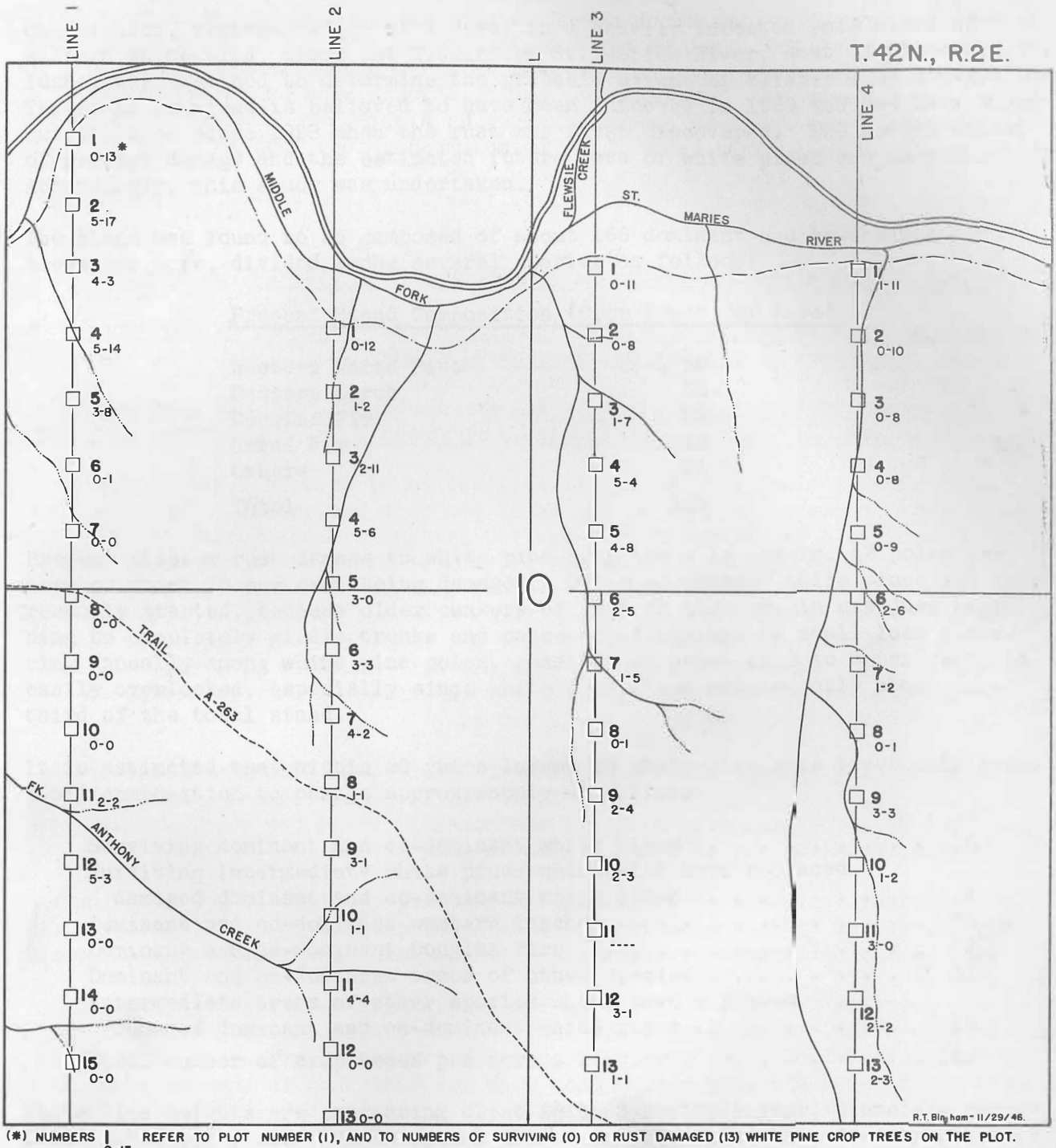
Results of the 20 per cent check show that besides the 187 bushes with 607 feet of live stem per acre removed by the eradication crews in 1946, there remain on the study area about 32 undetected bushes with 32 feet of live stem per acre. This number of missed bushes is about average, considering the difficulties encountered while searching for such small, well-screened bushes. The average residual bush has about one foot of live stem, supporting about 21 leaves. It reaches a height of only about one-half foot above ground level, is usually half or completely screened by surrounding vegetation, and is infected by the blister rust fungus in about four out of five cases.

The estimate of the number of ribes per acre based on the smaller sample contained in the four permanent sample strips is double that based on the 20 per cent check. The characteristics of the average sample strip bush, however, are similar in most respects to those of the 20 per cent check bush. The sample strip bush is slightly smaller, lower to the ground, and has fewer leaves, but is almost identical as to its screening and its degree of infection by the blister rust fungus.

Both estimates show that about three-quarters to four-fifths of the study area bushes were infected in 1946. The amount of sporidial inoculum which the infected bushes are capable of producing during late August and September periods when pine infection ordinarily occurs is, however, more important in determining the extent of pine infection during any one year than is the proportion of the bushes which are infected. Measures of the amount of sporidial inoculum available during the critical periods are the percentage of the ribes leaves then

infected, or better, the area of ribes leaf surface which at the beginning of the critical period bears live ungerminated telia. Measurements on the percentage of ribes leaves infected and on the area of infected leaf surface were made on the sample strips about August 15, 1946. These showed that the average sample strip bush had about 40 per cent or five of its twelve leaves infected, and that it supported about one and one-half square centimeters of live, ungerminated, telia-bearing infected leaf surface. The area of telia-bearing leaf surface would probably have been greater had not a fairly hot and dry early autumn plus early frosts resulted in premature casting of many infected leaves, and in many rust leaf-spots becoming necrotic.

It has already been pointed out that a true measure of the infective potential of these small ribes cannot be obtained until pine infection has been measured following a year extremely favorable for rust spread. Such a year was 1941, but neither the rust nor ribes concentrations on the area were suitable for this study. Since the small amount of new pine infection indicates that such a critical year has not occurred between 1942 and 1945, and since rust conditions in 1946 were similar to these four years, this study must be continued for at least several more seasons to obtain the desired information. A complete report on methods and results of this study will be issued in the near future in the form of a serial report.



(*) NUMBERS 1 0-13 REFER TO PLOT NUMBER (1), AND TO NUMBERS OF SURVIVING (0) OR RUST DAMAGED (13) WHITE PINE CROP TREES ON THE PLOT.

FIGURE 1.

SECTION 10, SHOWING THE 54 ONE-TENTH ACRE SAMPLE PLOTS AS THEY WERE LAID OUT ON 4 LINES FOR THE POLE DAMAGE STUDY. NOTE HEAVY RUST DAMAGE ALONG THE RIVER AND THE POOR WHITE PINE STOCKING BETWEEN STREAMS ON THE RIDGES.

BLISTER RUST DAMAGE TO POLE-SIZED WESTERN WHITE PINE ON THE MIDDLEFORK ST. MARIES RIVER

One section, representative of several in a heavily infected pole stand of western white pine, along the Middlefork St. Maries River, east of Clarkia, Idaho, was examined to determine the probable extent of blister rust damage. The stand examined is believed to have been infected in 1923 and has been under surveillance since 1928 when the rust was first discovered. The actual extent of present damage and the estimated future loss of white pines are unknown. Accordingly, this study was undertaken.

The stand was found to be composed of about 166 dominant and co-dominant crop trees per acre, divided among several species as follows:

Present Stand Composition (Crop Trees Per Acre)

Western White Pine	58
Western Larch	55
Douglas Fir	22
Grand Fir	10
Others	21
Total	166

Present blister rust damage to white pine crop trees is severe, 42 poles per acre or about 70 per cent being damaged. Dying of damaged white pines has only recently started, because older cankers of 1927 to 1937 origin are just beginning to completely girdle trunks and cause top-flagging. A small loss occurring annually among white pine poles, possibly as great as 3 to 5 per cent, is easily overlooked, especially since white pine stems compose only about one-third of the total stand.

It is estimated that within 20 years losses in white pine crop trees will cause stand composition to change approximately as follows:

Surviving dominant and co-dominant white pines	16
Surviving intermediate white pines which will have replaced damaged dominant and co-dominant white pines	4
Dominant and co-dominant western larches	55
Dominant and co-dominant Douglas firs	22
Dominant and co-dominant trees of other species	31
Intermediate trees of other species which have replaced damaged dominant and co-dominant white pines	19
Total number of crop trees per acre	147

White pine heights are increasing about 2½ to 3 feet per year, diameters about 0.25 inches per year. Should annual losses in white pine crop trees reach or exceed 5 per cent, increases in white pine volume will exceed volume losses due to blister rust for only about 10 years.

A complete Methods Project Serial Report on this damage study will be issued from the Berkeley Office of Blister Rust Control.

III. LABORATORY, GREENHOUSE, AND SPECIAL ACTIVITIES

Principal laboratory and greenhouse activities related to the testing of 2,4-D in various concentrations and dosages and with several amendments serving as spreaders and markers. On the basis of these tests the butyl ester, triethanolamine salt, ammonium salt, and sodium salt of 2,4-D were selected for field tests, and Titanox B30, Velvet White, Desert Whiting, and sulfur as markers. Tergitol No. 7 was found to be satisfactory as a spreader. Summer emulsion oil appeared to improve toxicity of 2,4-D to resistant ribes such as R. lacustre.

Greenhouse tests on the susceptibility of ribes to 2,4-D showed the following species reactions:

1. Highly susceptible to 2,4-D: R. bracteosum, R. petiolare, R. roezli.

2. Moderately susceptible to 2,4-D: R. cereum, R. cruentum, R. erythrocarpum, R. nevadense, R. sanguineum, R. viscosissimum.

3. Moderately to highly resistant to 2,4-D: R. binominatum, R. glutinosum, R. inerme, R. lacustre, R. lobbii, R. menziesii, R. montigenum, R. tularens.

Ribes in Class 1 above were killed by application of aqueous 2,4-D to aerial plant parts in concentrations as low as 90 ppm acid equivalent. Those in category 2 required a top spray of at least 750 ppm and a supplementary crown treatment for satisfactory kill. Preliminary tests of butyl ester and triethanolamine concentrates showed that ribes in class 2 could be killed by thorough coverage of leaves and stems by these finely atomized concentrates (20,000 ppm) of these chemicals. Ribes in class 3 were not significantly damaged by dilute aqueous sprays. Some top damage was obtained with mixtures of summer oil and 2,4-D butyl ester concentrates, but further experimental work is needed to devise improved herbicides for class 3 ribes.

In cultures of R. roezli seeds treated with 2,4-D, data showed that contact with 1,000 ppm of the sodium salt of 2,4-D for 24 hours reduced viability of seed from 92 per cent germination (in the control) to 14 per cent, and 200 ppm of the same chemical for 48 hours prevented germination (0 per cent).

Investigations were made of truck-mounted power spray rigs, of portable power sprayers, and of spray accessories such as hose, couplings, and nozzles in respect to the performance required of this equipment for practical field work.

Further progress was made in studying the germinative reaction of ribes and white pine seeds. Some changes are indicated in previously recommended methods for extracting ribes seeds from duff and soil samples to prevent loss of ribes seeds in the seed cleaning mill. Shop work was continued in the design of a machine for cracking western white pine seeds scheduled for direct seeding tests.

The following published papers or special research reports dealing with the above-mentioned subjects are recorded for the information of Blister Rust personnel:

Serial No. 131:
An Efficient System for Culturing Large Numbers of Small Seeds.
. . . . . C. R. Quick

Serial No. 132:
Ecology of the Ribes Associated with Sugar Pine - A General Statement
. . . . . C. R. Quick

Bureau MS 7711:
Rapid Estimation of the Phytocidal Action of Chemicals.
Science 103: 474-476. 1946.
. . . . . H. R. Offord

Bureau MS 8081:
Control of Host Plants in a Plant Disease Program.
Western States 8th Annual Weed Control Conference, pp. 39-43.
Reno, Nev. Feb. 26-27, 1946.
. . . . . H. R. Offord

Chemical War Waged on Blister Rust.
Timberman Vol. XLVII, No. 12, pp. 39, 74, 78. Oct. 1946.
. . . . . George A. Craig

PHOTOGRAPHIC AND EDUCATIONAL WORK, 1946

By
Frank O. Walters, Assistant Regional Leader
H. Miller Cowling, Photographic Specialist

With materials more readily available, there has been an expansion in activities of the photographic section. The transposing of all ribes eradication maps from the township to working unit basis caused heavy demands for black-line prints. The complete revision of the Inland Empire Ribes Eradication and Checking Manual and revision of many field forms heavily increased the Multilith and mimeograph work.

The photographic section extends its services to the Pacific Coast Region and to Pear Psylla Control.

A. Photographic Section

The purpose of this section is: (1) To maintain a pictorial record of control and investigative work, (2) to supply photographs, charts, maps, and manuals for facilitating the field work, and (3) to supply material for educational work.

Although photography is the major project of this section, other operations are Multilith offset printing, black-line printing, and mimeograph work. A summary of the 1946 work is given in the following table:

PHOTOGRAPHIC, MULTILITH, BLACK-LINE, AND MIMEOGRAPH WORK

Item	North-western Region	Pacific Coast Region	Pear Psylla Control	Total
PHOTOGRAPHIC				
Lantern slides, natural color	77			77
Lantern slides, black and white	4			4
Films developed, field films	119			119
Copies, 5x7	46	1	108	155
8x10	83	5	4	92
Printing, 5x7	1,098		48	1,146
8x10	5	45		50
9x11	826	32	145	1,003
Enlarging, 11x14 or smaller	64			64
16x20	2	12	84	98
18x22		26	14	40
Total items	2,324	121	403	2,848
MULTILITH				
Copies	43	14	6	63
Plates made	38	14	2	54
Cards printed	4,900	7,000	5,000	16,900
Cards printed, both sides	3,700	7,000	5,000	15,700
Total cards	8,600	14,000	10,000	32,600
Paper printed	73,400	10,000	9,500	92,900
Paper printed, both sides	16,100	1,500	8,000	25,600
Total paper	89,500	11,500	17,500	118,500
Total items	98,181	25,528	27,508	151,217
BLACK-LINE PRINTER				
Total maps printed	537		2,295	2,832
MIMEOGRAPH				
Total paper	14,350			14,350

B. Educational Section

As a part of on-the-job training, all employees were given fundamental information concerning the economic and pathological phases of blister rust control.

A greater effort was made to get those concerned with the white pine lumber industry into the field and intimately acquainted with control problems.

1. Bulletins and posters. The supply of suitable literature is running out. Requests for additional material have not been filled.

   Literature was made available to all camps. Two hundred and twenty-three pieces of material were passed out to persons calling at the Spokane office.

2. Talks, slides, and motion pictures. The narrative for a training film has been prepared. If the diagrammatic portion of the film can be completed this winter, enough field pictures have been taken so that the partially-completed film can be used for training purposes next field season.

   The western blister rust film was shown 22 times before a total audience of 880 people.

   For the second successive year use was made of the Balopticon to display blister rust slides at the County Fair in Coeur d'Alene, Idaho.

APPROPRIATIONS
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
NORTHWESTERN REGION OF BLISTER RUST CONTROL

Regular Appropriations

Fiscal Year 1946:		
Project 3101.14 (Administrative)	$103,600.00	
Project 3103.14 (Cooperative)	224,400.00	
		$328,000.00
Fiscal Year 1947: (as of 12/31/46)		
Project 3101.14 (Administrative)	$121,000.00	
Project 3103.14 (Cooperative)	681,011.00	
		$802,011.00

Contributed Funds (deposited with U. S. Treasury)

State of Idaho		$ 15,000.00	
Clearwater Timber Protective Association	$6,416.58		
Potlatch Timber Protective Association	5,262.40		
Priest Lake Timber Protective Association	4,260.44	15,939.42	
			$ 30,939.42

TABLE 1

FEDERAL EXPENDITURES, NORTHWESTERN REGION OF BLISTER RUST CONTROL
CALENDAR YEAR 1946, REGULAR APPROPRIATIONS

	Project	Salaries	Expense	Total
	January 1 to June 30, 1946			
I	Planning, Coordination, Technical Direction			
	1.1 - Clearwater Operation, Idaho	$ 5,423.85	$ 960.42	$ 6,384.27
	1.2 - St. Joe Operation, Idaho	7,414.79	1,381.91	8,796.70
	1.3 - Coeur d'Alene Operation, Idaho	2,039.96	71.77	2,111.73
	1.4 - Kaniksu Operation, Idaho	14,359.77	3,603.08	17,962.85
	1.6C - Cabinet Operation, Montana	964.99	95.04	1,060.03
	1.6K - Kootenai Operation, Montana	964.99	95.53	1,060.52
	1.7G - National Park, Glacier	1,092.25	--	1,092.25
	1.7R - National Park, Rainier	--	--	--
	1.7Y - National Park, Yellowstone	1,660.89	209.16	1,870.05
	1.A - Office Maintenance	11,354.54	4,651.53	16,006.07
	1.B - Supervision	6,062.93	582.51	6,645.44
	1.C - Education and Information	--	74.88	74.88
	1.D - Control Investigations	1,682.16	17.90	1,700.06
	1.E - Methods Development	--	74.62	74.62
	Total, Project I, Jan. 1 - June 30, 1946	$ 53,021.12	$11,818.35	$ 64,839.47
III	Cooperative Ribes Eradication on State and Private Lands			
	3.1 - Clearwater Operation, Idaho	$ 26,419.05	$13,539.83	$ 39,958.88
	3.2 - St. Joe Operation, Idaho	35,805.96	20,392.41	56,198.37
	3.4 - Kaniksu Operation, Idaho	14,745.99	15,027.21	29,773.20
	Total, Project III, Jan.1-June 30, 1946	$ 76,971.00	$48,959.45	$125,930.45
	July 1 to December 31, 1946			
I	1.1 - Clearwater Operation, Idaho	$ 7,435.23	$ 902.24	$ 8,337.47
	1.2 - St. Joe Operation, Idaho	8,566.78	1,445.86	10,012.64
	1.3 - Coeur d'Alene Operation, Idaho	4,123.98	144.49	4,268.47
	1.4 - Kaniksu Operation, Idaho	9,080.75	1,006.46	10,087.21
	1.6C - Cabinet Operation, Montana	1,112.11	108.28	1,220.39
	1.6K - Kootenai Operation, Montana	1,112.11	108.28	1,220.39
	1.7G - National Park, Glacier	333.66	106.73	440.39
	1.7R - National Park, Rainier	183.71	86.91	270.62
	1.7Y - National Park, Yellowstone	1,983.11	374.33	2,357.44
	1.A - Office Maintenance	17,592.93	3,827.08	21,420.01
	1.B - Supervision	6,007.69	606.05	6,613.74
	1.C - Education and Information	--	56.60	56.60
	1.D - Control Investigations	670.80	65.53	736.33
	1.E - Methods Development	--	130.78	130.78
	Total, Project I, July 1-Dec. 31, 1946	$ 58,202.86	$ 8,969.62	$ 67,172.48
III	3.1 - Clearwater Operation, Idaho	$ 64,346.20	$27,442.00	$ 91,788.20
	3.2 - St. Joe Operation, Idaho	69,472.02	21,532.49	91,004.51
	3.4 - Kaniksu Operation, Idaho	79,150.29	28,006.48	107,156.77
	Total, Project III, July 1-Dec. 31, 1946	$212,968.51	$76,980.97	$289,949.48

TABLE 2

SUMMARY OF EXPENDITURES FROM STATE AND PRIVATE FUNDS, 1928 - 1946, IDAHO

Year	State	Private	Total
1928	$ 2,518.55	$ 2,264.32	$ 4,782.87
1929		19,027.66	19,027.66
1930		20,000.00	20,000.00
1931	5,000.00	35,905.32	40,905.32
1932	8,003.43	11,186.33	19,189.76
1933			
1934	29,154.06		29,154.06
1935	15,000.00		15,000.00
1936	16,998.25		16,998.25
1937	15,001.25		15,001.25
1938	15,000.44		15,000.44
1939	15,438.04		15,438.04
1940	10,034.48		10,034.48
1941	7,542.73	15,756.40	23,299.13
1942	22,761.68	15,440.78	38,202.46
1943	12,252.13	386.68	12,638.81
1944	12,506.60	15,612.98	28,119.58
1945	6,287.68	5,111.03	11,398.71
1946	14,943.35	26,651.65	41,595.00
Total	$208,442.67	$167,343.15	$375,785.82

Organization of the Northwestern Regional Office - 1946

1. Regional Leader in Charge, H. E. Swanson, Pathologist
2. Assistant Regional Leader, F. O. Walters, Pathologist
3. Cooperative Local Control:
   a. Clearwater Operation, Idaho:
      Operation Supervisor, F. J. Heinrich, Pathologist
      Assistant Operation Supervisor, H. J. Faulkner, Forester
      Unit Supervisor, C. W. Long, Agent
      Checker Foreman, J. C. Gonyou, Field Aid
   b. St. Joe Operation, Idaho:
      Operation Supervisor, H. J. Hartman, Forester
      Assistant Operation Supervisor, W. F. Painter, Pathologist
      Unit Supervisor, R. H. Kliewer, Agent
      Camp Superintendent, G. W. Schmaltz, Agent
      Special Duty Assistant, R. E. Myers, Agent
   c. Coeur d'Alene Operation, Idaho:
      Operation Supervisor, A. L. Pence, Jr., Forester
      Operation Supervisor, M. C. Riley, Forester
   d. Kaniksu Operation, Idaho-Washington:
      Operation Supervisor, H. A. Brischle, Pathologist
      Assistant Operation Supervisor, J. C. Gynn, Pathologist
      Unit Supervisor, L. J. Easley, Agent
      Checker Foreman, G. M. Houghton, Agent
   e. Montana Operation:
      Operation Supervisor, A. S. Skoglund, Pathologist
   f. National Parks, Washington, Montana, Wyoming:
      Operation Supervisor, M. C. Riley, Forester
      Assistant Operation Supervisor, C. M. Chapman, Pathologist
4. Projects:
   a. Education and Information:
      H. M. Cowling, Photographic Specialist
   b. Methods Development and Control Investigation (BLR-1-6):
      V. D. Moss, Forest Ecologist
      J. F. Breakey, Pathologist
      C. R. Stillinger, Pathologist
      R. T. Bingham, Agent
      (Personnel assigned to Northwestern Region by H. R. Offord)
5. Business Administration and Clerical:
   a. E. G. Schmidt, Administrative Assistant
      E. K. LaPrey, Storekeeper
      L. C. Miller, Automobile Mechanic
   b. M. L. McWold, Administrative Assistant
      M. Wilson, Clerk
      M. C. Yourt, Clerk
      B. J. Knautz, Clerk
      J. E. Bolitho, Clerk
   c. J. R. Pringle, Clerk
      A. B. Treffry, Clerk-Stenographer
      N. L. Klum, Clerk-Stenographer
   d. L. E. Klatt, Administrative Assistant, Personnel
      K. P. Schofield, Clerk-Stenographer